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## INDIVIDUAL PSYCHOLOGY: A STUDY IN PSYCHOLOGICAL METHOD.

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### PART I. HISTORICAL AND CRITICAL.

#### § 1. *Individual Psychology.*

The systematic consideration of the problems grouped under the name of "Individual Psychology" is of but recent date. Indeed, the only treatment of the whole subject for its own sake is that contained in a paper published in 1895,<sup>1</sup> by Mm. Binet and Henri. A great deal of work has, however, been done by others, outside of France, which properly belongs to this branch of Psychology; notably the investigations by Prof. Kraepelin and his followers in Germany, whose object is by psychological methods to study the mentally abnormal in comparison with mentally normal individuals. For the sake of this comparison the variations in the psychical processes of normal individuals must, Prof. Kraepelin says, first be studied; but the methods employed are such only as are demanded by the comparison that is the main object of the investigation.<sup>2</sup>

Many American psychologists have made researches in the

<sup>1</sup> A. Binet et V. Henri: *La psychologie individuelle*. In *L'Année psychologique*, Vol. II, 1895, pp. 411 ff.

In a foot note to the article *La mesure en psychologie individuelle* (*Revue philos.*, Vol. XLVI, p. 113), M. Binet makes the claim that he is the first French psychologist to employ the term "Individual Psychology."

<sup>2</sup> E. Kraepelin: *Der psychologische Versuch in der Psychiatrie*. In Kraepelin's *Psychologische Arbeiten*, I, 1, pp. 1 et seq. See also Axel Oehrn: *Experimentelle Studien zur Individual-Psychologie*. *Ibid.*, pp. 92 ff.

field of Individual Psychology; but there has been no unity of method among the investigators, nor have the results been systematized or their value estimated. An important characteristic of most of this work, however, is the large proportion of anthropometric tests, which are accorded an importance equal to those which are strictly mental.<sup>1</sup> In the class of the more exclusively psychological investigations may be named the experiments of Prof. Jastrow concerning the community of ideas between men and women, made at the University of Wisconsin, and similar experiments made by Prof. M. W. Calkins at Wellesley College;<sup>2</sup> as well as a brief study in Individual Psychology by Miss C. Miles, which makes use of the method of the questionnaire.<sup>3</sup>

It is clear, then, that any treatment of Individual Psychology almost necessarily involves a consideration, more or less complete, of the work done by Mm. Binet and Henri. For this purpose it is well to ask first of all what views these authors take of the scope and relations of Individual Psychology. Individual Psychology, they maintain, takes up the thread of investigation at the point where General Psychology leaves it. "General Psychology studies the general properties of psychical processes, those, therefore, which are common to all individuals; Individual Psychology, on the contrary, studies those psychical processes which vary from one individual to another: it seeks to determine the variable qualities, and the extent and manner of their variation according to the individual." Memory may very well illustrate the point. The law of memory is as follows: the time necessary to fix impressions in

<sup>1</sup> Tests employed by Prof. Jastrow at the World's Fair of Chicago in 1893. Analyzed in *L'Année psychologique*, Vol. I, p. 532. See also J. McK. Cattell, *Mental Tests and Measurements*. *Mind*, 1890, Vol. XV, pp. 373 ff.; J. A. Gilbert: *Researches on the Mental and Physical Development of School Children*. *Stud. Yale Laboratory*, II, 1894; J. McK. Cattell and L. Farrand, *Psych. Rev.*, Vol. III, 1896, pp. 610 ff.; J. Jastrow and G. W. Morehouse: *Some Anthropometric and Psychologic Tests on College Students*. *Am. Jour. of Psychology*, Vol. IV, pp. 420 ff.

<sup>2</sup> The original account of these experiments appeared in an article entitled *A Study of Mental Statistics*, in the December, 1891, number of the *New Review*, under the heading "The Community of Ideas and Thought-Habits of Men and Women." It appeared also in the article *Community and Association of Ideas: a Statistical Study*, by J. Jastrow; *Psych. Rev.*, I, p. 152 (1894). Similar experiments made at Wellesley College by C. C. Nevers, under the direction of M. W. Calkins, *Psych. Rev.*, Vol. II, p. 363 (1895), gave a different result. A criticism of the latter by Prof. Jastrow appeared in the *Psych. Rev.*, Vol. III, p. 68 (1896). A reply to this by Miss Calkins is found in the same volume of the *Psych. Rev.*, p. 426; and a further reply by Prof. Jastrow, p. 430. Both investigations are discussed and criticised by Amy Tanner, *Psych. Rev.*, Vol. III, pp. 548 ff.

<sup>3</sup> *Am. Jour. of Psychology*, VI, p. 534.



memory increases at first proportionally to the number of impressions; but, after a certain limit, the 'time of acquisition' increases more rapidly than the number of impressions. This law of memory is common to all; no one can escape it; but the law does not say that the limit, beyond which the time necessary to retain the impressions is no longer proportional to the number of impressions, is fixed and common for all. This limit is a variable property of memory, and here Individual Psychology comes in, and investigates the subject in its different aspects; it enquires in what measure this limit varies in different individuals, and whether it remains constant in one individual for different kinds of impressions. If *A* and *B*, after one hearing, can remember ten and seven letters respectively out of twelve, can they remember with the same relative readiness an equal number of figures, colors, or what not? Individual Psychology goes on, further, to enquire if there is any relation between the position of this limit and the psychological 'self' of the individual, — as, for example, his age; or between the limit of memory and some other psychical process.

### § 2. *The Psychology of Structure and of Function.*

Before proceeding to a more detailed statement of the problems of Individual Psychology, as set forth by M. Binet and his collaborator, a digression must be made in order to consider a distinction that has lately been drawn between the points of view of 'experimental' and of 'descriptive' psychology. This distinction is set forth by Prof. Titchener in an article entitled "The Postulates of a Structural Psychology."<sup>1</sup> A comparison is here made between the science of biology, in its widest sense, and that of psychology. The former may be approached from any one of three points of view.

"We may enquire," says Prof. Titchener, "into the structure of an organism, without regard to function, by analysis determining its component parts, and by synthesis exhibiting the mode of its formation from the parts. Or we may enquire into the function of the various structures which our analysis has revealed, and into the manner of their interrelation as functional organs. Or, again, we may enquire into the changes of form and function that accompany the persistence of the organism in time, the phenomena of growth and decay. Biology, the science of living things, comprises the three mutually interdependent sciences of morphology, physiology and ontogeny."

If a more general view is taken, and regard is had for the whole number of living beings as parts of a collective life, we have, corresponding respectively to the three branches named, the more general sciences of taxonomy or systematic zoölogy, the science of classification; oecology, which deals with ques-

<sup>1</sup> *Philosophical Review*, Vol. VII, pp. 449 ff. Sept., 1898.

tions of geographical distribution, of the function of species in the general economy of nature; and phylogeny, the biology of evolution, dealing with the problems of descent and of transmission.

The same principle of division here employed in biology may be applied with equal validity to psychology.

"We find a parallel to morphology in a very large portion of 'experimental' psychology. The primary aim of the experimental psychologist has been to analyze the structure of mind; to ravel out the elemental processes from the tangle of consciousness. . . . His task is a vivisection, but a vivisection which shall yield structural, not functional results. . . . There is, however, a functional psychology over and above the psychology of structure. We may regard mind, on the one hand, as a complex of processes, shaped and moulded under the conditions of the physical organism. We may regard it, on the other hand, as the collective name for a system of functions of the psychophysical organism. The two points of view are not seldom confused. The phrase 'association of ideas,' *e. g.*, may denote either the structural complex, the associated sensation group, or the functional process of recognition and recall, the associating of formation to formation. In the former sense it is morphological material, in the latter it belongs to what I must name (the phrase will not be misunderstood) a physiological psychology. Just as experimental psychology is to a large extent concerned with problems of structure, so is 'descriptive' psychology, ancient and modern, chiefly occupied with problems of function. Memory, recognition, imagination, conception, judgment, attention, apperception, volition, and a host of verbal nouns, wider or narrower in denotation, connote, in the discussions of descriptive psychology, functions of the total organism."

So much for the 'morphological' and 'physiological' psychologies, which are indeed the most important. The other branches of biology have also their counterparts. Ontogenetic psychology, the psychology of individual childhood and adolescence; taxonomic psychology, dealing with the classification of the emotions, impulses, temperaments, the typical mind of social classes, etc.; the functional psychology of the collective mind, which has as yet been but little worked out; and, lastly, phylogenetic psychology, enriched by the labors of the evolutionary school, complete the list.

### § 3. *The Problems of Individual Psychology.*

Mm. Binet and Henri class the problems of Individual Psychology under two main headings. It is called upon:

1. to study the variable properties of psychical processes; to find how, and to what extent, these processes vary from one individual to another; and
2. to ascertain the relation of the processes to each other in a single mind; to find out whether they are mutually dependent, or whether there are some fundamental processes upon which all the others depend.

*A. The First Problem of Individual Psychology.*

The first problem has two aspects, according as emphasis is laid upon the processes themselves, or upon the individual who experiences them. The first aspect is the one with which Individual Psychology must necessarily start. How and to what extent mental processes vary from one individual to another is the question which must be answered, to furnish, as it were, the materials for further investigation. Then we may go on to ask if these variations follow any regular laws, corresponding to the classification of individuals into groups by profession, sex, age, etc.

A considerable number of independent investigations have been made in the line of this first problem of Individual Psychology, under both its aspects. Sensations are the processes which have been subjected to the greatest amount of research, on account of their value for some practical end. The tests in regard to individual variations in visual sensations, such as color blindness, which have been made among engineers, pilots, and in other professions whose members are called upon to recognize color signals, are experiments of this kind. Mm. Binet and Henri state, as the result of a brief historical survey of the work in this field, that "the individual differences for sensation are very feeble and insignificant in relation to the differences in the higher faculties." Hence much of the work done is of comparatively little value for Individual Psychology, which seeks to characterize individuals and classes according to the variations which they exhibit in the mental processes composing the 'real' or 'actual' mind of every-day life.

Other researches have been carried out, in which the emphasis has been laid, not upon the variations themselves, but upon their relation to the individual; and the individual's mental processes have been studied in reference to the class to which he belongs. The investigations of Prof. Jastrow and Miss Calkins regarding the Community of Ideas in men and women (mentioned above) come under this head. The investigations of what may be called 'professional psychology' also belong here, and would be of the highest importance for Individual Psychology were it not that they fail to apply a strictly scientific method. As it is, however, they are rich in suggestions of more exact work, and may thus lead to systematic research along the same lines.<sup>1</sup>

<sup>1</sup> L. Arréat: *Psychologie du peintre*. Paris, 1895. This considers anthropological as well as psychological traits, and the author has drawn his material largely from literature, biographies, and documents of all kinds concerning artists of every time and country. Owing to the imperfect nature of the material, the conclusions are

The question now arises whether the first great problem of Individual Psychology should be classed as an enquiry of 'structural' or 'functional' psychology. In the first place, is the *material* with which the Individual Psychologist works the same as (or similar to) that which lends itself to the investigation of the Experimental Psychologist? The Experimental Psychologist takes mental processes in as simple a form as he can find them. By means of laboratory methods, he exercises the most rigid control over conditions, in order that all complicating factors may be excluded, and that the result may represent as nearly as possible the working of the elemental factors. Thus the Experimental Psychologist, acknowledging that a pure sensation is an abstraction,—that it never occurs in our concrete experience,—yet endeavors by artificial means to secure in his subjects states of consciousness in which the desired sensations are sufficiently isolated from their respective contexts to give information as to their properties and the laws governing the variations of these properties.

Does the Individual Psychologist adopt a similar method of procedure? Is it his aim to take the simplest existing processes, in order to investigate any possible individual variations, and thus to account for unlike results from the building up of unlike materials? It is by the answer to this question that two groups or schools of Individual Psychology are differentiated. M. Binet and the French psychologists answer "no;" Prof. Kraepelin and the German psychologists answer "yes." The American psychologists make no explicit statement on the subject, but their practice is rather with the German than with the French school. The German school maintains that, at least for the present, only simple mental processes can be studied with the exactness necessary for scientific work. "Die Probleme der Individual-psychologie können bisher nur in

necessarily exceedingly general. Prof. James denies this work the adjective 'scientific.'

L. Dauriac: *Psychologie du musicien*, Articles I-VII. *Revue philos.*, Vol. XXXV, pp. 449, 595; Vol. XXXIX, pp. 31, 258, 404; Vol. XLII, pp. 1, 155.

Harmon: *Psychologie du militaire professionnel*. Paris, 1894. This is a work which belongs to sociology more than to psychology. It traces the moral effects of army life and the reaction of these upon society.

A. Binet et J. Passy: *Études de psychologie sur les auteurs dramatiques*. *L'Année psychol.*, I, pp. 60 ff. The creative imagination is here the chief subject of investigation. A number of French dramatists give information, either by word of mouth or in writing, regarding the composition of their works; the choice of subject, the method of literary labor, the 'furniture' of the mind during inspiration, etc. The 'interview,' like the questionnaire, is a valuable auxiliary method; but the results therefrom cannot claim the validity of the stricter laboratory procedures.

ganz einfachen Formen psychischen Geschehens gesucht werden."<sup>1</sup> Mm. Binet and Henri make explicit and repeated statements of the opposing standpoint in the article which we have been considering. On p. 417 is found the passage here translated. "The higher and more complex a process is, the more it varies in individuals; sensations vary from one individual to another, but less so than memory; memory of sensations varies less than memories of ideas, etc. The result is, that if one wishes to study the differences existing between two individuals, it is necessary to begin with the most intellectual and complex processes, and it is only secondarily necessary to consider the simple and elementary processes."

An examination of particular investigations which have been made by representatives of these two schools will enable us to judge whether the principles of each have been strictly adhered to. Kraepelin and Oehrle must be taken as the German representatives. Kraepelin, in the first number of the 'Psychologische Arbeiten,' lays down the principles, methods and aims of the work which he proposes to undertake. Oehrle—in part, at least—carries out these methods, and the results are embodied in the second article of the same number of this periodical.

Since for Kraepelin men are divided into two great classes, the mentally normal and the mentally abnormal, all individual differences are summed up for him under the one great category of *mental capacity*. It is his aim to learn as much as possible about the psychology of the abnormal mind. For this purpose investigations of the normal mind are first necessary, and then further investigations of the normal mind, under certain abnormal conditions which produce consciousnesses comparable to those normally present in the insane. The differences in mental capacity, therefore, which Kraepelin considers subject to experimental investigation, are those which are most directly connected with physical conditions. The kinds of mental capacity to be thus investigated he classes under the three heads of capacity for the perception of sensory stimuli, for the association of ideas, and for voluntary movement. The psychophysical *conditions* which are studied under these three heads are the influence of practice and the persistence of the effects of practice, the capacity of the special memories, the influence of fatigue and the capacity of recovery from fatigue, the depth of sleep, and the capacity for concentration of the attention. Prof. Kraepelin states that this list is as far as can be from exhausting the conditions which it is possible and even necessary to determine experimentally; but he affirms

<sup>1</sup> Max Brahn: *Zeit für Ps. u. Ph. d. Sinnesorgane*, Vol. XII, p. 280.

that it is upon the basis of an investigation such as this that the study of personalities must be founded.

The operations, suggested by Kraepelin and adopted by Oehrn, that are chosen as affording means for the investigation of these conditions are as follows: 1. Perception: the counting of letters, the search for particular letters, proof reading. 2. Memory: the learning of twelve nonsense syllables, and of series of twelve figures. 3. Association: the addition of series of one-place numbers. 4. Motor functions: writing from dictation, and reading as fast as possible.

The time aspect alone of these operations is noted experimentally. The absolute durations of the processes, and their mean variations, give information in regard to the general mental capacity of the individuals tested, and to the relation of the processes to each other in respect of complexity, etc.

The fluctuations in the rate of the processes during periods of continuous work, or after stated intervals of rest, show the influence of practice in increasing the efficiency of work, of fatigue in decreasing this efficiency, and of rest in increasing the efficiency by means of the removal of fatigue, or decreasing it by obliterating the effects of practice, according to the length of the rest interval. A strict numerical expression is given to all the facts thus deduced. "If we wish to be instructed," says Oehrn (p. 144), "concerning the psychical efficiency of a person, we ask first concerning the quantity of work he can do in a certain time, or the time necessary to do a certain amount of work. We shall, therefore, have to consider in the first place the individual differences in the absolute duration of the functions investigated" (*i. e.*, the average time, in thousandths of a second, that it takes to count one letter, to read one syllable, to write one letter, to make one addition, or to learn one number or syllable). "The second question is as to the quality of the work, by which alone the value of the quantity may be estimated." A direct answer to this latter question Oehrn does not attempt to give in his work, but considers the omission of secondary importance, since all of his subjects had attained a degree of education where large differences in the quality of the particular processes tested could hardly enter. "Further, it is of importance," he continues, "for judging an individual, to know if he is in condition to work with constancy. If this is not the case, the quality of the work must suffer on the one hand, while on the other, large fluctuations will also indicate a diminution of quantity, since they are to be taken as evidences of fatigue. Hence the more numerous and larger the fluctuations are, the lower must be our estimate of the psychical energy of the individual considered." The mean variations in time give numerical representations of these fluctuations.



"Finally, we have to ascertain how the subjects behave in regard to practice and fatigue. It is necessary to distinguish between that practice which enters into a single experiment, . . . and the permanent practice which manifests itself, in a repetition of the experiment, by a shortening of the time necessary to perform the work." The mean variations and the relation of practice and fatigue in an individual are considered as of more importance for judging his capacity than the absolute duration of his work. Tables are given, presenting the numerical results in each of these regards, obtained from every one of Oehrn's ten subjects. From the Tables a comparison of the subjects could be made; but Oehrn leaves this comparison to be made by the reader. He is chiefly concerned to show that by the aid of the method he has described it is possible to obtain a conception of the psychical status of an individual. To establish a normal status would be the task of far more extended investigations.

Contrast with this work in Individual Psychology an investigation made in France, by Mm. Binet and Henri, on Memory for Sentences (Memory for Ideas).<sup>1</sup>

In the memory of figures or letters, it is chiefly auditory, visual or tactual sensations that are retained: the memory is one of relatively simple conscious elements. Memory of isolated words approaches this in its essential character; for, though the sense of the words enters here, and the memory is partially a memory of ideas, yet it is impossible in experiments upon the memory of isolated words to determine how much influence upon the subject's power of recall is due to the sense of the words, and how much is due simply to the subject's desultory memory, or memory of separate, unconnected impressions. Hence it is necessary to investigate the memory of ideas by itself.

Mm. Binet and Henri chose eight sentences, or closely connected groups of sentences, ranging in length from 11 to 86 words. These sentences were read before the pupils of several classes in four elementary schools in Paris. The children were required to reproduce the sentences in writing immediately after hearing them. The attention of the pupils was properly directed, since an explanation of the requirement was given to them in advance. The main work in the investigation was,

<sup>1</sup> A. Binet et V. Henri: *La mémoire des phrases (Mémoire des idées)*. In *L'Année psychologique*, I, 1894, p. 24. This article appeared before that on Individual Psychology by the same authors, and the investigation is not explicitly termed an investigation in Individual Psychology. The test employed is, however, closely similar to one proposed in the latter article, and represents very fairly the kind of material which the writers believe Individual Psychology should employ.



of course, the interpretation of the results handed in by the pupils. The number of children submitted to the experiments was about 510.

One of the chief difficulties in the interpretation of results lies in the fact that not every word in the sentence or sentences represents an independent idea. One cannot say that there are just as many ideas in the sentence as there are words. Pronouns, articles, prepositions, etc., have no meaning apart from other words with which they are closely connected; and short phrases are remembered as a single idea. Hence it became necessary to separate the sentences into word-groups, each group representing as nearly as possible one idea. Here is an example of this division of one of the shorter sentences: a sentence of 20 words and 8 groups of words:

Le petit Émile | a obtenu | de sa mère | un joli | cheval mécanique | en récompense | de sa bonne conduite | à l'école. |

In the longer sentences or series of sentences the division becomes more difficult and assumes a more or less arbitrary character. A passage of 60 words and of 19 groups may show this:

Une vieille paysanne | âgée de 64 ans, | la veuve Mouillet, | qui habitait une petite maison | sur la route déserte | des Recolets | avait conduit | son troupeau | dans les champs. | Pendant qu'elle faisait de l'herbe pour ses animaux | une vipère | cachée derrière | les fagots—s'élança sur elle | et la mordit | à plusieurs reprises | au poignet. | La pauvre femme | en est morte. |

The results obtained from the investigation were, in brief, these. 1. Memory for sentences (or ideas) shows a slight but constant increase with age. This was ascertained from the fact that in the higher classes more groups of words were completely retained, and fewer words totally forgotten,—*i. e.*, entirely left out, without any substitution whether right or wrong,—than in the lower classes where the pupils were younger. 2. The memory for sentences is, in certain fixed conditions under which these experiments were tried, twenty-five times superior to the memory for isolated words. 3. The number of forgotten words increases rapidly with the length of sentences or series of sentences; for a sentence of 20 words (8 groups) it was  $\frac{1}{80}$ , while for a series of 80 words (24 groups) it was  $\frac{1}{3}$ . 4. The losses of memory fall upon accessory parts of the sentence, not upon the essential parts, *i. e.*, not upon the parts that are logically or psychologically important. 5. In short selections there are more substitutions of synonymous words than there are completely forgotten words, but in long selections the reverse is the case. In short sentences, though the particular words may be forgotten, the ideas are remembered, and the child invents his own terms. We find, therefore, a large number of synonyms. In long selections, however, the

ideas themselves are too numerous to be remembered, and the completely forgotten words outnumber the synonyms. 6. Children have a tendency to simplify the syntax, and to replace the words read to them by other words taken from their own more familiar vocabulary. This Mm. Binet and Henri call 'verbal assimilation.' 7. When sentences are somewhat long, children show a tendency slightly to alter the meaning of the sentence. These alterations are frequently by way of additions, and may be of two kinds, intellectual and emotional.

It will be seen that the only factors in this problem that lend themselves to numerical expression are (1) the *quantity* of words or groups remembered, substituted, or forgotten by any pupil; (2) the number of pupils who remember or forget any particular word or group; and (3) the age of the pupils who remember best or worst.

The character of the material employed in this investigation is clearly and confessedly of the complex type. Although the sentences are mainly concrete, as suited to the child mind, they yet imply a considerable faculty of generalization and a synthetic power of attention in combining the various ideas into a situation. The mental processes involved are therefore highly complex, and the investigators have here used the material which they assert to be most suitable for the examination of the Individual Psychologist.

Has the material of the German psychologists the opposing character of extreme simplicity? The only simplicity that Kraepelin claims for his work is simplicity of *method* (method of continuous work). This has to do, not with the measurement of single independent acts, but with the continuous performance of regularly connected similar acts. The acts or processes themselves are not simple. Oehrn has analyzed each into three phases: the centripetal phase, or process of perception; the central phase, or process of association; and the centrifugal phase, or process of movement. The three phases vary in importance and duration in the different kinds of operations used in the experiments, and the fluctuations observed in continuous work may therefore be due to alterations in that phase of the whole process which is predominantly involved in the exercise in question. This analysis is, however, far from being an analysis into the simplest psychological elements, made for the sake of detecting variations in these elements. We are free to conclude, therefore, that the material used by the Individual Psychologist is, as a rule, less simple than that upon which the general Experimental Psychologist spends his best efforts.

Nevertheless, the distinction between the German and French schools is not invalidated by this statement. There is a con-

siderable degree of difference in the complexity of material employed by these two schools, and there is a still greater difference in method resulting from the difference in material. The more exact methods of the Germans are inapplicable to the tests which the French insist upon as of primary importance to the Individual Psychologist. It is, perhaps, on account of this difference in method that Mm. Binet and Henri, by a slight confusion, exaggerate the difference in the material employed by themselves and by other Individual Psychologists. The specific criticism which they pass upon Prof. Kraepelin's work, however, is not so much that it lacks complexity as that it lacks scope. The experiments are too partial, they say, and for that reason entirely fail to characterize an individual.<sup>1</sup>

The position of Mm. Binet and Henri may be more clearly understood if we notice briefly some of the 'mental tests' proposed by American psychologists. The tests given by Prof. Jastrow at the World's Fair at Chicago<sup>2</sup> are among the most complete. There are here five different experiments for touch and cutaneous sensitivity; five experiments for sight and touch together (such as the equalizing of movements by sight); twelve or more experiments for sight alone, including appreciation and division of lengths, rapidity and acuteness of vision, etc. Other tests have to do with memory for letters, lines, colors and forms, and with simple reaction times. Place is also given to anthropometric tests of height, development of the head, and the relation of mental to physical development, etc. It will be seen that these experiments have chiefly to do with sensations and simple movements. Even the memory tests have regard to memory for sensations rather than to memory for ideas.

Other lists of tests given by American psychologists show the same characteristics. Prof. Cattell, in an article in *Mind*,<sup>3</sup> gives the results of two different series of tests, one numbering ten and the other fifty. The first series is as follows: (1) pressure measured by the dynamometer; (2) maximal rapidity of arm movement; (3) minimal distance between two points on the skin which can be perceived as two; (4) pressure necessary to produce pain; (5) least perceptible difference for weight of 100 gr.; (6) time of simple reaction to an auditory impression; (7) time necessary to name a color; (8) division of a length of 50 cm. into two equal parts; (9) reproduction of an interval of ten seconds; and (10) number of letters retained after a single hearing. The longer series is analogous to this, the same relative importance being given to the elementary processes.

<sup>1</sup> P. 432.

<sup>2</sup> These are analyzed in *L'Année psychologique*, Vol. I, p. 532 (1894).

<sup>3</sup> *Mental Tests and Measurements*. *Mind*, 1890, Vol. XV, p. 373.

The "Researches on the Mental and Physical Development of School Children," by Dr. J. A. Gilbert,<sup>1</sup> employ the following tests: (1) muscle sense; (2) sensitivity to color differences; (3) force of suggestion; (4) voluntary motor ability; (5) fatigue; (6) weight; (7) height; (8) lung capacity; (9) reaction-time; (10) discrimination-time; and (11) time-memory. All these tests are subject to exact numerical measurement. The muscle-sense was measured by the least perceptible difference in gr. of lifted weights; sensitivity to color-difference was measured by the shades of red-colored fabric picked out by a child as being alike (every piece of fabric being in reality slightly and measurably different in shade); force of suggestion was determined by the difference in gr. between two weights of the same bulk but unequal weight, which the child picked out as being equal respectively to a weight large in bulk and one small in bulk which (unknown to the child) were of equal weight. For the experiments on voluntary motor ability and fatigue, reaction-time, discrimination-time and time-memory, Dr. Gilbert constructed an apparatus which he calls the reaction-board. This board holds a magnetic tuning fork, vibrating one hundred times per second; a double-post switch; a stimulating apparatus; a reaction key; a tapping apparatus; a commutator, and an Ewald chronoscope. The electric current is supplied by two Grove batteries. Voluntary motor ability was measured by the number of taps the child made on the tapping apparatus in five seconds, and fatigue by the per cent. of loss of rapidity of tapping after the movement had been continued for 45 seconds. Reaction-time and discrimination-time were measured by the chronoscope, in hundredths of a second. The time-memory was measured by allowing the chronoscope to run a certain length of time, and then starting it a second time, and requiring the child to press the key when the second running had lasted as long as the first. The difference between the two periods of time marked the accuracy of the time-memory. Weight, height, and lung capacity were measured by standard instruments suited to these purposes.

The detail which has been given is sufficient to illustrate the difference in material and method between the French Individual Psychologists, and those engaged in similar work in America. It may be said, therefore, in general, that there is a wide divergence in opinion and practice among the investigators of Individual Psychology, as to whether the first problem of the science, on the score of material and method, is properly of a structural and morphological character, or whether it should be classed as belonging to a functional or 'physiologi-

<sup>1</sup> *Studies from the Yale Psychological Laboratory*, II (1894), p. 401.

cal' psychology. The Americans make it approximate to the former character; the Germans seem to favor the former in regard to method, but hold a middle position in regard to material; while the French psychologists depart as far as possible from the point of view of morphology, both in material and in method. The American view is founded upon no explicit theory of Individual Psychology. It may, therefore, be temporarily set aside. Considering only the French and German psychologists, we find that Individual Psychology seems, on the whole, rather to fall outside of structural psychology. It might be, however, that strict analysis of the results obtained from the study of complex processes would give information in regard to the ultimate elements. Is this, in reality, the case? The outcome of the researches we have hitherto noticed would seem to indicate a negative reply. But it is too early, yet, to look for an entirely decisive answer. Until a more thorough investigation of the methods proposed by Individual Psychology, or possible to it, is carried out, the question must be left undecided.

#### *B. The Second Problem of Individual Psychology.*

Individual psychology has to study not only the variations of mental processes from one individual to another, and the relation of these to individuals or classes of individuals, but also the relations of the mental processes to each other in the mind of one and the same individual. Are all the mental processes definitely related and correlated? Is there one process more important than all the rest, so that a variation in this process involves a perfectly definite variation in all the other processes? Or, on the other hand, are there a large number of mental processes, practically independent of each other, and capable of assuming an almost infinite variety of combinations in as many individuals?

Again we have to ask whether this inquiry by Individual Psychology is of a structural or physiological character. The answer is not far to seek; it is, in fact, implied in the very form in which the questions of this second problem clothe themselves. It is the investigation of the relation to each other of the various *ways of working* of the psychological organism. It is, therefore, the psychological problem which corresponds to the general problem of physiology. As the latter asks what are the basal functions of the living physical organism, so the former seeks to find in the mental sphere those activities whose relations to each other and to the psychological organism are analogous to those existing between functions in the sphere of physical life. The problem may, and does, imply analysis; but it is an analysis of which the common activities of every-day

life form the starting point, and their better understanding, the goal. The atomistic point of view is abandoned, and the mental activities of man are taken, as it were, in the large; and the various relations of these activities, partially seen and understood by common observation, are confirmed, explained, and rendered explicit by the use of the experimental method. This is the task laid down as the second problem of individual psychology,—a task which belongs, therefore, to the psychology of function.

The difficulties attendant upon an investigation of the questions involved in this branch of Individual Psychology are very great. The mental processes which make up the sum of everyday psychical activity are of so complex a nature that it may be doubted whether experimentation can be applied in such a way as to yield results which meet the requirements of scientific precision. Mm. Binet and Henri have, however, discussed three methods by which investigation may be carried on. (1) The first method is that of abnormal cases; wherein advantage is taken of instances where there is extreme development or enfeeblement, or even loss, of some psychical processes, to study the consequent modification of other processes. Where there is a loss of memory, *e. g.*, we may try to find the effect of such loss upon imagination, power of concentration of the attention, etc. That is to say, the object is to ascertain whether the presence of an abnormal activity involves a definite deviation from the normal on the part of other mental processes. The collection of a large number of investigations of this kind would show the relation in which these processes stand to one another. There is, however, a difficulty. How shall we determine the *amount* of deviation from the normal, which one process must possess in order to entail a corresponding deviation of other processes? This question must be answered by means of experimentation, before the more general problem can be solved.

This method has been employed to some extent, and has furnished some important information. By its means was ascertained the fact of the independence of the partial memories;<sup>1</sup> the fact, *i. e.*, that we "can have an extraordinary memory for figures, without in the least excelling in memory for letters, or colors, or any other impressions whatever." Moreover it has shown that a total loss of some partial memories may fail to show any influence upon the other partial memories.<sup>2</sup>

(2) Another method, one that is applied to normal indi-

<sup>1</sup> By A. Binet: *Psychologie des grands calculateurs et joueurs d'échecs*.

<sup>2</sup> Mm. Ribot and Charcot, quoted by Binet and Henri.



viduals, may be stated thus: "In a single individual one may vary a psychical process, and see if this variation involves changes in other processes in the same individual." For this purpose only those processes are chosen which are useful for the comparison of individuals. Experiments upon sensations, manner of fatigue, etc., are thus eliminated. The practical application of this method is attended with great difficulty, owing to the complexity of the conditions. It depends, evidently, upon the possibility of placing an individual, by artificial means, in such a condition that certain mental processes shall be performed in the way in which they take place normally in certain other individuals. An individual who gave a quick reaction time, owing to great power of attention, might, by having his attention artificially distracted, lengthen his reaction time until it corresponded to that of other individuals who normally gave long reaction times from small power of attention. Given a constant correspondence between length of reaction time and degree of concentration of the attention, and the rapidity of reaction of an individual might be taken as an index of his power of attention.

This method has been applied by Prof. Kraepelin, in his investigation into the influences of slight poisons upon certain psychical processes: these poisons producing, in a normal individual, effects analogous to those caused by certain mental diseases in their early stages. Valuable as the method may be in theory, however, its range of application is necessarily limited, and it is, according to Mm. Binet and Henri themselves, more useful as a source of suggestion than as affording specific results.

(3) The third method, which is likewise the simplest and most practicable, is that in which the experimenter chooses in advance a number of psychical processes, and proceeds to study them in several individuals, noting whether the individual differences in the different processes run parallel to each other, and correspond in a regular manner. From such correspondence he can infer the existence of a more or less close relation among the different processes. The experiments of Oehrn and Gilbert, which have been commented on above, are partial applications of this method, as are also the various 'mental tests' proposed by American psychologists. The disadvantage of the latter, according to Mm. Binet and Henri, is that they are calculated to give but little information in regard to the second problem of Individual Psychology, since they pay but slight regard to the complex processes. The method itself has the advantage of serving equally well for the study of either of the two problems of Individual Psychology. The results may be looked at with a view to ascertaining the variations which occur in the chosen processes from one individual to another,



and the relation of these variations to the sex, age, profession, etc., of the individuals in whom they are observed; or the results may be studied in regard to the correspondences which may constantly manifest themselves between the different processes in any single individual. For the latter point of view, however, it is necessary that the processes chosen for investigation shall be of that complex character which distinguishes the every-day activities of one individual from those of other individuals. Mm. Binet and Henri affirm this with emphasis. They say (p. 426): "Is it necessary to know that *A* has a finer tactual sensibility than *B*, that he can distinguish between two colors better than *B*, or that he can move his arm faster than *B*, in order to distinguish these individuals from each other? Certainly not. On the other hand, how could one try to characterize them, and to distinguish them from each other, if one had no data concerning their imagination, their memory, their power of attention, their power of observation, their power of analysis, their reasoning, their stability of will, their affective life, etc.?" That these activities are more difficult to investigate than the elementary activities is a disadvantage which these authors believe is of comparatively small importance, since in the "superior psychical faculties," to use their terminology, there are stronger individual differences, and hence the need of precision is not so great.

The method of 'mental tests' is that most available for present use, and, since the particular tests which have been proposed by others are considered by Binet and Henri to be inadequate, these authors give a long and detailed list of tests which they consider will bring to light the strongest individual variations, a knowledge of which in one individual will give a general idea of that individual, and serve to distinguish him from others belonging to the same class.

The tests are grouped under the following heads. I. Memory: (a) visual memory of geometrical design, (b) memory of sentences, (c) musical memory, (d) memory of colors, (e) memory of figures. II. Nature of mental images: (a) letter squares, (b) interrogation. III. Imagination: (a) passive imagination (method of blots and of abstract terms), (b) constructive imagination (development of a theme), (c) imagination of design (composition or completion of a picture), (d) literary imagination (construction of sentences using given substantives or verbs). IV. Attention: (a) duration of attention (series of reaction times or successive reproduction of lengths from memory), (b) range of attention (counting of metronome beats and execution of several simultaneous acts). V. Faculty of comprehension: (a) talent for observation (analysis of a machine), (b) fineness of discrimination (discrimination of syno-

nyms and criticisms of sentences). VI. Suggestibility: (a) of sensations and perceptions (identification of lines and perception of odors), (b) of imagination (expectant attention), (c) of emotivity (apprehension, fear), (d) of involuntary and unconscious movements. VII. Æsthetic sentiment: (a) preference in geometric forms, colors, perfumes, (b) questionnaire. VIII. Moral sentiments (method of pictures). IX. Muscular force and strength of will (persistence in muscular effort). X. Motor skill and sureness of eye.<sup>1</sup>

The general conditions which the proposed tests must fulfill are given by the author as follows. They should be simple, that is, they should require little apparatus; the time for the whole number of tests should not exceed an hour and a half for one individual; they should be varied in such a way as to avoid fatiguing the subject; and the means of determination should be as independent as possible of the personality of the experimenter, in order that the results obtained by one experimenter may be compared with those of another.

A casual reading of the descriptions given of the various tests will convince one that the first condition is fulfilled. The apparatus required are small as to number and simple in character. In regard to the requirement of time, however, the result is not so satisfactory. One test alone, that of the memory of sentences, of a progressively abstract character, could take scarcely less than a quarter of an hour: add to that the ten or fifteen minutes allowed for the development of a theme for constructive imagination, and it will be seen that the time is going far too quickly to allow an application of even a majority of the remaining tests. This fact has a bearing also on the next requirement, that there should be as great a variety as possible in the tests in order to avoid the disturbing effects of tedium and fatigue; for, although a certain variety in the experiments is advantageous for keeping up the interest of the subject, yet a crowding of many dissimilar tests into a brief space of time is equally disadvantageous. The aim is, of course, in these experiments to have the processes tested as nearly like those of every-day life as possible, and a monotonous repetition of exactly similar operations would defeat this aim. There is, how-

<sup>1</sup> A number of these tests were applied by Dr. É. Toulouse in the psychological part of the investigation of which M. Émile Zola was the subject. The whole investigation is described by Dr. Toulouse in his book *Enquête médico-psychologique sur les rapports de la supériorité intellectuelle avec névropathie*. Paris, 1896. Inasmuch as the psychological tests employed are not the main reliance of the investigator in the formation of his judgments, but are considered only as giving confirmation to the judgments based on general observation of the subject, of his written works, etc., the essay can scarcely be called a purely experimental study of Individual Psychology.

ever, in every-day life, as the mind turns from the performance of one set of operations to another, a certain period of preparation. If the attention is, as it were, wrenched from one sort of activity to another very different sort, without any preparation, confusion is apt to ensue. So in the activities experimentally controlled, too sudden changes do not conduce to the most favorable conditions of the attention. In the tests laid down by Mm. Binet and Henri, therefore, the requirement of variety in arrangement is a just one, for the attention demands a frequent change of object. A radical change of object, however, requires time for the readjustment of the attention to the new conditions; and time must, therefore, be provided in sufficient measure. As much effort is expended and consequently as much fatigue is produced by working hard as by working long; it is poor economy to save time at the expense of effort. The chief reason why Mm. Binet and Henri make the requirement of brevity for the tests is the practical difficulty of securing the subject of experimentation on more than one occasion. This difficulty does not seem to be an unsurmountable one, as it probably would apply only to a restricted number of cases. When such cases do occur, judgment must be exercised in balancing the rival claims of variety or range of tests and of sufficient time to perform the tests most efficiently.

Whether the last requirement is fulfilled, whether, that is, the results of different experiments using these tests are perfectly comparable, is a question which can be decided only upon a further consideration of the individual tests. Owing to the complex material which is investigated, it is easy to see that this condition is a hard one to comply with perfectly. M. Binet treats of this subject in a separate article, *La mesure en psychologie individuelle*.<sup>1</sup> There is a quantitative aspect to most of the experiments, and this may be measured with a fair amount of accuracy. There are two possible methods of measurement, the first being a measurement of the results obtained while the test remains the same. Thus in memory, for example, accuracy may be measured by the amount by which the reproduced series falls short of the original series. The rapidity with which a certain amount of work is performed may measure some other processes. Enumeration and evaluation may also give numerical results, but of much less precise a character. The second method of measurement consists in a gradation of the experiment, the results being reduced to a maximum of simplicity. An example of this method would be, finding the maximal number of objects which a subject could retain after looking at them for five seconds. First three objects are shown,

<sup>1</sup> *Revue philos.*, Vol. XLVI, Aout, 1898.

then four, then five, etc., until the maximum is reached. The gradation of tests in terms, not of number but of kind, is difficult, as, *e. g.*, where sentences become more and more abstract.

M. Binet states that the measurement of which he is speaking is not a physical or absolute measurement, but only a method for the classification of individuals. There is no fixed standard by reference to which all individuals may be evaluated; but of certain specific individuals one can say that under certain fixed conditions, when A's memory of isolated words is 12 and that of B is 6, A's memory of isolated words is better than B's. It would be unwarranted, however, to say that A's memory for isolated words is exactly twice that of B, since all the words may not have the same value for consciousness.

All methods of measurement have for their aim the classification of all the individuals tested according to a quantitative scale. The tests, however, bear another aspect beside that of quantity. Quality must also be considered; and here it is necessary to class individuals according to different categories. M. Binet does not go into detail in regard to the possibilities of such a classification, but he suggests that the tests might differentiate literary and scientific types, or emotive (moral or egoistic) types.

## PART II. EXPERIMENTAL.

### § 4. *Description of Tests.*

The following experiments were undertaken during the academic year '97-'98 as a study of Individual Psychology based, in general, upon the theories, and to a large extent upon the specific suggestions of Mm. Binet and Henri, as contained in their article *La psychologie individuelle*. The theory was provisionally accepted that the complex mental processes, rather than the elementary processes, are those the variations of which give most important information in regard to the mental characteristics whereby individuals are commonly classed. It is in the complex processes, we assumed, and in those alone, that individual differences are sufficiently great to enable us to differentiate one individual from others of the same class. Many of the particular tests recommended by the French psychologists were also adopted, but were considerably modified in the general conditions of their application by the purpose of our own investigation.

The aim of this work was (1) to ascertain the practicability of the particular tests employed, and (2) to answer the more general question as to the tenability of the theory upon which they are based, in so far as this can be judged by the experiments. In other words, we desired to assure ourselves whether

investigations of this kind enabled us to advance, at least, toward a solution of the problems of Individual Psychology; whether those individual variations, and those correspondences which are necessary for classifying individuals, and for estimating the relative importance of the several processes in a single individual, could thereby be discovered.

In view of these aims, and also of the criticisms of the general conditions demanded by Mm. Binet and Henri for the application of the method of 'tests,' the procedure was necessarily different from that laid down by these psychologists. To make sure that the tests give real individual differences, and not chance variations, it is necessary to apply them to the same individuals, not once, but several times, in order that it may be observed whether the variations in the different individuals maintain a constant relation to one another at various times and, consequently, under varying subjective conditions. Instead of single tests, therefore, series of similar tests for each activity were arranged. This necessitated, of course, a very large extension of the time beyond the limit allowed by the French investigators. The advantages of a short period of varied experimentation were, however, to a large degree attained. The experimental work of each subject was divided into periods of one hour each, and separated by intervals of one week. Within a single hour-period the tests were varied as much as possible. As a rule, only one or two experiments belonging to the series of a particular test were given.<sup>1</sup> In this way the tedium and fatigue due to monotonous repetition of similar operations were avoided, and a fair degree of interest in the work was maintained by the subject. The additional precaution was taken of separating by intervals longer than a week the experiments which were found to be especially trying or disagreeable to the subjects; as, *e. g.*, the development of a theme, or description of a scene or event, employed as a test for constructive imagination.

Since the experiments were of this detailed character, the number of subjects was necessarily restricted. The fact that the investigation was for the purpose of dealing with variations in individuals of *the same class*, afforded a further reason for this restriction. The subjects consisted of seven advanced students in the Sage School of Philosophy, three men (B, E, R, and W. M), and four women (T, G, V. M, and L. R), all of whom had had training in introspection. In the experimental work the subjects were divided into three groups; two groups of two subjects each, and a third group of three sub-

<sup>1</sup> Tests of memory for figures, words and letters, were exceptions to this rule.

jects. This arrangement was made owing to the fact that a large number of the experiments could be performed as readily by two at a time as by one. A group of three presented some difficulty to the experimenter, but not of a serious nature. As a rule, the system of grouping worked well, and caused much saving of time.

Certain of the tests which are especially adapted for collective study were given not only to these groups, but also, by the aid of Prof. Titchener, to the less advanced students taking the undergraduate (junior year) course in Experimental Psychology. The first ten minutes of the lecture hour were usually devoted by Prof. Titchener to this work, the test in every case being conducted by him. Occasional failure of attendance on the part of some members of the class causes a corresponding incompleteness in these results. They are useful, however, as allowing comparison between the less and the more completely trained students.

Though the tests as above described are intensively of greater range than those of Mm. Binet and Henri, they are extensively much more restricted. Only those tests were retained which have to do most directly with the intellectual activities. The æsthetic sentiments were touched upon in a very tentative manner in our investigation, while the moral sentiments, strength of will, etc., were either left out of account altogether, or entered only indirectly as results from tests which were applied primarily for a different purpose.

We are now ready to consider the tests in detail.

### I. *Memory.*

1. *Memory of Letters.* Twenty sets of 12 letters each were prepared. As the object was to test the memory for isolated characters, it was desirable to avoid the formation of syllables by successive letters, in so far as this could be done without the total banishment of vowels from the series. The apparatus employed was Jastrow's Memory Drop, by means of which one letter at a time might appear before the eyes of the subject from behind a small opening in a screen. The movements of the drop must be made by hand; the experimenter regulated them by making them coincide so far as possible with the beats of a metronome marking intervals of one second. Each letter, therefore, was exposed to the view of the subject for approximately one second. The experiments took place in this way. The subject was seated at such a distance from the screen that the letters could be clearly seen. A series of twelve letters was then exposed, one by one, as above described. The subject was required immediately to recite the twelve letters in their order. If any mistake was made, the experiment was repeated; the letters being again exposed, and the subject again required to recite them correctly. This whole operation was repeated until the subject was able to name the twelve letters without error. The number of times it was found necessary to expose the series was noted. The answers to questions put by the experimenter in regard to the manner in which the letters were memorized,



as well as observation of the results of the various repetitions, gave information in regard to memory type, and therefore served to supplement the results obtained from another test, the purpose of which was the discovery of the nature of the subject's mental images.

This experiment differs from many others which are to follow, in that it could be performed with only one subject at a time; and also in the fact that several sets of similar series of letters were given to the subject in a single hour.

2. *Memory of Figures.* This test is almost precisely similar to the one above. The chief differences result from the fact that with figures the available characters are fewer, and hence in a series of twelve there must necessarily be some repetitions. Further, the figures, unlike letters, no matter how arranged, make an intelligible combination. The tendency to continue the separate figures is hindered somewhat,—in cases, almost entirely,—by the manner in which they are given successively; but in so far as the tendency to combine is exhibited, it shows an approach toward the memory of ideas. In the preparation of the series of figures it was our aim to avoid putting any two figures in their natural or inverted order, or immediately repeating the same figure. The experiment was conducted in the same manner as that described above.

3. *Memory of Words.*<sup>1</sup> This test has two parts. In the first place the experimenter read a series of 7 disconnected words, at the rate of about two words a second, and the subject was required immediately to recite these in order. If any word was left out of this recital, it was named by the experimenter, and any error was corrected. A second series of 7 words was then read, and the subject was required to recite them as before; then a third series, and so on, until seven series of seven words each had been read and recited. For the second part of the experiment the subject was required to name, in the order in which they occurred to him, as many as possible of the whole 49 words. In the first case one had immediate memory of verbal sounds; while in the recapitulation, which occurred at an interval of at least three minutes from the time of reading of the first short series, the auditory memory of the words had had time to be dimmed, and the sense of the words became a more important factor for memory. The difference in number of words remembered when taken series by series, and when taken as a whole, indicates the relation which subsists between the immediate memory and the memory of conservation in the individual tested. Four sets, each containing 7 short series, were given to all our subjects. The conditions of this test, also, required that one subject should be taken at a time.

4. *Memory of Sentences.* There were given two types of experiments under this head; (a) one in which the passage to be remembered was confined strictly within the limits of a single period, and (b) another, in which the passage was longer, comprising in some cases two, three, or even more sentences. For convenience, we may term the first type that of short sentences, and the second that of long sentences. All the sentences, both long and short, were graduated into five series, according to their degree of abstractness. This graduation was more or less arbitrary. It was difficult to define five distinct degrees; it was occasionally a matter of some little doubt, therefore, which of two successive degrees should claim a particular sentence. Although, however, the difference in abstractness between one degree and the next was often slight, the difference between the extremes of

<sup>1</sup> See A. Binet et V. Henri. *La mémoire des mots.* L'Année psychologique, Vol. I, 1894, pp. 1-24. Also E. Toulouse. *Enquête médico-psychologique sur les rapports de la supériorité intellectuelle avec la névropathie.* Émile Zola. 1896.



the series could not pass unnoticed. The following series of short sentences will serve as illustration:

I. A huge fire of logs blazed on the great kitchen hearth, and, at a table covered with maps and papers, neatly set in order, the general sat writing.

II. The Chinese regard us as strictly just and truthful, and it is only when we disabuse them of that impression that they show us any disrespect.

III. Whatever comes from the brain carries the hue of the place it came from, and whatever comes from the heart carries the heat and color of its birthplace.

IV. If the Necessitarian doctrine be true, then there is not merely no foundation either for morality or religion, but no basis either for divine or human law.

V. Thought is necessary to make even feeling or sensation to be conscious feeling or sensation; and thought can take place only through discrimination, or perception of difference.

The sentences were chosen from literature: magazine articles, novels, essays, and philosophical works. Fenimore Cooper, Carlyle, Huxley, Leibniz, and many others furnished their quota. Of the short sentences there were twenty sets of five series each, making one hundred sentences in all, ranging from 22 to 28 words in length. Two sets, only, of the long sentences were employed, making ten sentences, ranging from 51 to 64 words in length. All the sentences, both long and short, were given to the seven advanced subjects, while ten sets of short and the two sets of long sentences were given to the juniors.

The experiment was performed in this way. A short sentence was read aloud to the subject at the rate of about three words in two seconds, care being taken that all words should receive, so far as possible, equal emphasis. The subject was required to write down the sentences immediately after the reading. One set of five sentences was usually given to the advanced subjects in a single experimental hour. Sometimes two, and sometimes three sentences were given to the juniors at one meeting of the class. The subjects were requested, after writing the sentence, to underline *once* those words which they felt sure were remembered correctly, *twice* those words of which they were doubtful, and *three times* those words which they felt pretty confident were different from the words dictated. When words had completely fallen out of consciousness, the subjects left *spaces*, the length of which indicated the supposed gap in memory. The sentences were 'marked' under four headings: (1) verbal accuracy, that is, the number of words correctly remembered; (2) order, that is, the number of words occupying their proper position in the sentence; (3) sense, that is, the number of words which, either from the fact that they reproduced those in the sentence read, or that they were essentially synonymous with them, preserved the sense of the original sentence; (4) certainty of memory, that is, the number of words which were marked very doubtful (underlined three times) plus one-half the number of words which were marked somewhat doubtful (underlined twice). All these estimates were reduced to percentages, that the results of all the short sentences might be comparable. This system of marking has its disadvantages, as it depends in some degree upon the personal judgment of the marker. Especially is this the case with regard to the sense of sentences. Substitutions or errors in comparatively unimportant parts of a sentence may change the meaning slightly, but not essentially; still, the sentence can hardly be classed in such a case as reproducing perfectly the sense of the original sen-

tence. As all the sentences, however, were marked by one person, the error throughout is a fairly constant one, and the results obtained from different individuals may be, with justice, compared. The long sentences were intended to conform more nearly to those employed by Mm. Binet and Henri,<sup>1</sup> in the investigation briefly described above in Part I, with the exception that our sentences were graduated according to degree of abstractness. Their method of estimating the results was likewise followed. Each sentence was divided into groups, each group containing one important word with, perhaps, some subordinate words linking it to the rest of the sentence, that the number of groups might coincide with the number of ideas. The necessarily somewhat arbitrary character which this division assumes was before noticed, and is, of course, inimical to precision in results. The points noted in the results were: (1) number of the groups in a sentence which were retained intact; (2) number of words completely forgotten; (3) number of synonyms employed; and (4) number of other substitutions. It should be said that the test of long sentences was conducted in a similar manner to that of short sentences, the only difference being in the reading. No effort was made to have the reading monotonous, but every word was given its normal emphasis and inflection.

5. *Memory of Sounds.* To make a detailed test for memory of sounds would have required an amount of time for preparation and for experiment which it was impracticable to give in this investigation. We were content, therefore, with propounding to the subjects certain questions in regard to the readiness and accuracy of their musical memory. They were as follows:

1. Can you carry an air at all?
  2. Can you reproduce an air after hearing it once? In your head? By whistling or singing?
  3. How accurate is this reproduction (if it has been tested)?
- This test was applied both to the advanced students and to the juniors.

## II. *Mental Images.*

1. *Letter Squares.* This test was one described and recommended by Mm. Binet and Henri. White cards were prepared, three by four inches in size, and divided by black lines into twelve equal squares, each square containing in its center a large printed letter. As the longer side of the card was taken as the horizontal, there were four letters on a horizontal line and three on a vertical. Ten different combinations of letters were chosen for these cards, to be used in ten different experiments. There were other cards, precisely similar to these, except that the small squares were left blank. The experiments were first conducted in this way. Each of the subjects had before him, on the desk or table, right side up, a card of blank squares, and also, face downward, a card containing the printed letters. The requirements of the experiment were explained to him. Upon the signal of the experimenter he should turn up the printed card, and learn the letters and their respective positions in the squares. Twenty seconds were to be given for this. At the second signal of the experimenter, the subject should turn down the printed card, and proceed immediately to reproduce the letters upon the blank cards in their proper places. The subject was further requested to write on the reverse of the (originally blank) card the nature of the

<sup>1</sup> A. Binet et V. Henri. *La mémoire des phrases. L'Année psychologique*, Vol. I, pp. 24 ff. See also *La psychologie individuelle*, *ibid.*, Vol. II. The same type of test was used likewise by Dr. Toulouse in the investigation mentioned in a previous footnote.

mental images from which the reproduction was made. Five of the experiments were made in this manner: in the remaining five a modification was made in regard to the time. The subject was allowed only five seconds between the first and second signals for studying the letters. There was then an interval of thirty seconds, before the experimenter gave a third signal to fill the blank cards. This had the effect of making the introspection of memory images more easy. It also increased the number of errors; and, as Mm. Binet and Henri make the usefulness of the test to depend principally upon the study of the nature of the errors made, this fact is of importance. Like-sounding letters may be substituted for the correct ones, thus indicating the presence of auditory images; or errors may be traced to a similarity in form of the letters substituted, etc. The letters in the printed squares were arranged in a variety of ways. The last letters in each horizontal line occasionally rhymed, and in rare cases consecutive letters formed syllables.<sup>1</sup>

2. *Questions.* Under this heading may be placed the information gained from the writing on the reverse of the blank cards, mentioned above, as well as that obtained in questioning the subjects in connection with the tests for memory of words, letters and figures.

### III. *Imagination.*

1. *Passive Imagination.* (a) Method of blots. This test is also one mentioned by Mm. Binet and Henri, and is similar to that used by Dr. Dearborn.<sup>2</sup> The blots were formed very much after the fashion described by the latter writer. A drop of ink was allowed to fall upon a small Bristol-board card, and a piece of paper was placed over the card and rubbed with the finger. In this way a variety of forms were made on different cards; ten cards, in all, being employed. This test was applied to the advanced students only. A card bearing a blot was handed to the subject, who was requested to name all the objects suggested by the form of the whole blot or of any part of it. He was allowed to turn the card about in any direction. The objects suggested were written down by the subject. Five minutes were allowed for this experiment. The number of objects seen in the blot, their kind, and the manner of reporting them, gave information in regard to the passive imagination of the individual tested.

(b) Associations with Abstract Terms. These experiments consist in interrogating the subject as to what he represents to himself when such words as 'force,' 'infinity,' 'justice,' etc., are said, and also as to his possession of number forms or visual schemes for the arrangement of months, seasons, etc.

2. *Constructive Imagination.* (a) Mechanical imagination. Two tests were used for this: a German toy called the "Magic Box," and a 'puzzle' watch. The magic box was a box of tin about 3 inches in diameter, through the center of whose lid projected the tip of a magnetized revolving rod, actuated through an internal mechanism of gears and fly wheel by a thrust on an arm projecting through the side of the box. A small triangular piece of tin with rounded corners, to which could be attached paper dolls or animals, would, of course, if put upon the cover of the box near the rod, be drawn around as the magnetized pivot revolved. This toy was shown to the subjects, as well as the method of starting the motion by pushing the projecting

<sup>1</sup> One set of letters was taken from the example given by Mm. Binet and Henri. Three others were copied from those used by Dr. Toulouse. Certain errors on the part of the printer made slight changes in these latter, however.

<sup>2</sup> G. Dearborn. *Psychological Review*, May, 1897, pp. 309 ff. Cf. the same author, *A Study of Imagination*. *Am. Jour. of Psychology*, Vol. IX, pp. 183 ff.

arm; but they were requested not to handle the toy. The requirement made of the subjects was to explain the mechanism causing the movement of the tin standard around the cover of the box. The two points in the explanation should have been (1) the magnetic connection between the revolving rod and the tin standard, and (2) the particular internal mechanism by which the revolution was initiated and maintained.

In the puzzle watch the works were confined within a small crescent-shaped portion of the cylindrical space, while the rest of the watch, except the nickel rim, was completely transparent, having glass faces front and back. All that could be seen in looking through this portion was the hands, the rod on which they were carried, and the gilt numerals on the glass dial-plate. There was, therefore, no visible mechanical connection between the hands and the works. The subjects were required to explain the movement of the hands. This was caused by the revolution of an inner glass plate held in a toothed metal ring. Both in this experiment and in the one above the subjects were given five minutes for a written explanation, but an extension of time was granted if desired. These tests were carried out with the advanced students only.

(b) Literary Imagination. Three kinds of experiments came under this head: (a) the construction of sentences, (b) the development of a given theme, and (c) the choice of a topic for composition. The construction test was performed in this way: Three substantives or three verbs were read to the subject, and he was required to write in five minutes as many and as varied sentences as possible, embodying in each the three words given. Ten experiments with substantives, and ten with verbs were tried with each of the advanced students. The same number of experiments was given to the Juniors, but there was a modification in the time requirement,—only two minutes instead of five minutes being allowed for the composition of the sentences. In order, however, to have results directly comparable with those obtained from the advanced students, two tests with substantives and two with verbs were also given to the Juniors, in which five minutes were allowed for the composition of the sentences. In each case the number and quality of the sentences were noted. For the next test, that of the developing of a theme, two sets of topics were chosen, one set for narration or description, and the other for exposition. Ten minutes were given for writing. Three topics for narration (or description) and three for exposition were given to all<sup>1</sup> the advanced students. The third test consisted in naming ten titles for essays, five coming under each of the above named classes, and requiring the subject taking the experiment to choose from the ten given the five upon which he would prefer to write papers, provided that such writing were demanded of him. The topics given for test (b), development of a theme, were the following: (1) For imaginative treatment: "Capture of a Fortress," "The Escape of a Prisoner," and "A Forest Fire." (2) For exposition: "The Delays of Justice," "The Influence of Newspapers," and "The Mission of Music." The topics given for test (c), choice of titles, were these: "In a Snowstorm," "A Polar Landscape," "A Puritan Sabbath," "My Opposite Neighbor," "Man Endowed with the Power of Flight," "Civilization not Regeneration," "Wisdom in Charity," "Friendship of Books," "Fiction as a Vehicle of Truth," and "The Eloquence of the Bar and that of the Pulpit." A sort of modification of the last two tests was given to the Juniors. On two occasions they were granted a choice between two titles (one of each type), from which they should sketch out a plan for an essay. The

<sup>1</sup> With the exception that W. M. failed to take one of the topics for exposition.

time allowed for this was five minutes. The topics submitted on the first occasion were: "The Capture of a Fortress" and "The Friendship of Books;" on the second occasion, "The Escape of a Prisoner" and "The Influence of Newspapers." The length of the written compositions, their manner of development, the kind of topic chosen, and the character of the plans made for them, are sources of information as to the imaginative type of the individual. Further information was sought by general questions in regard to individual tastes and tendencies, such as the favorite reading of the subject, his fondness for reflective games, the theater, opera, etc.

#### IV. Attention.

1. The degree of attention habitually exercised by an individual was measured by the quickness and accuracy with which a certain given task was performed. The task chosen for this purpose was the cancellation of every letter *a* from the words of a printed page. In order that the operation might not become too mechanical, the subject was sometimes requested to cancel the letter *e* instead. Proof pages (12 mo.) of the English translation of Külpe's "Introduction to Philosophy" were used for the cancellation, the pages averaging about 350 words. At a signal from the experimenter the subject began reading to himself at a normal rate, crossing every *a* as it came to his notice, but never going back to cancel those overlooked when they were first passed over. As soon as the page was finished the subject gave a signal. The experimenter was thus enabled to read from the stopwatch the time required for the cancellation. The number of errors was afterward determined. Eight pages were thus submitted to each of the advanced subjects for experiment; but, as the subject matter was a possible means of distraction from the work of crossing out *a*'s, other printed pages of a different character were also used. One page of concrete description (376 words) was prepared and printed without the use of punctuation, spacing or capitals. Another page of philosophical matter (340 words), a page of disconnected words, and a page of 'pied' matter, were printed in the same manner. Copies of these pages were used for experiments in the same way as those described above. In the Külpe proof all the subjects had different pages, while in the other tests the copies were exactly similar for each kind of page. In the latter case, therefore, results from the different subjects were immediately comparable, since no complication could arise from difference of subject matter. All the subjects cancelled the *a*'s from eight pages of proof, one page of concrete matter, one page of abstract matter, two pages of disconnected sentences and one page of 'pied' matter.

A further experiment upon the degree of attention was tried with the seven advanced subjects by requiring them to read aloud, first, a page of concrete description, printed without punctuation, capitals or spacing; and, secondly, a similar page of exposition of abstract thought. The time necessary for each reading was noted, as well as the correctness of the words and expression. The first page consisted of a description of the situation and equipment of a blockhouse upon a densely wooded island. The most notable feature of this page was the frequent occurrence of monosyllabic words; while that of the second or abstract page consisted in the repetition of certain words, such as 'subject,' 'object,' 'relation,' 'absolute,' 'power,' 'force,' etc. The first page was slightly longer than the second, the number of words being 376 and 340 respectively.

2. *Range of Attention.* To test the subjects in regard to range of attention, a single experiment was tried in conformity with that sug-

gested by Mm. Binet and Henri. The subject was required to read aloud with normal rapidity and expression a passage of ten lines from a contemporary novel. The time taken by this reading was noted. The subject was then requested to read the same passage in precisely the same way as before, but while doing so to write on a sheet of paper beneath his hand the letter *a* as many times as possible. Again, the subject was requested to reread the passage, this time writing *a b* repeatedly. During a fourth reading, *a b c* were the letters required to be written. A fifth and last reading was then requested, during which the subject should write as far down the alphabet as he could without altering his reading; while if the alphabet were completed and time still remained, he should begin again at *a* and write as before. The chief difficulty in this experiment was in maintaining a uniform rate in the reading throughout the five tests, for the tendency in almost every case was to lengthen the reading in those tests which involved the simultaneous writing of letters, thus allowing time for a rapid oscillation of the attention from one set of acts to the other, and destroying their simultaneity. Where success was attained, however, in keeping the reading unchanged, the number of letters of the alphabet written by the subjects gave information in regard to individual differences in ability to perform practically simultaneous acts and thus in range of the attention; while in the cases where there was a decided lengthening of the reading during the performance of writing, this very fact was an indication of lack of such ability.

#### V. Observation; Discrimination.

This corresponds to the heading termed by Mm. Binet and Henri the 'faculty of comprehending,' and comprises phenomena known under various names, such as *talent of observation*, *keenness of mind*, *good sense*, *judgment*, etc., owing to the difficulty of precise definition. By it is meant the power to perceive relations, to distinguish the real and essential from the apparent and accessory; the ability to analyze and systematize. The lack of analysis of the processes involved makes exact investigation impossible, but certain tests have been adopted which are calculated to throw light upon the individual differences in this aspect of mind. Of these tests, the first two—those which have especially to do with observation—may be classed also as tests of memory; but since the memory is immediate, while the time of observation is very short, the individual differences seem to be attributable to the latter rather than to the former. The first test was applied after this manner. The reproduction of a picture, cut from a magazine, with the title carefully trimmed off, was shown to the subject for a period of thirty seconds, after which he was requested to write out a full description of what he saw, five minutes being allowed for the writing. This experiment was tried upon all the advanced students with two different pictures. The first picture, entitled the "Golden Wedding," was more satisfactory than the second, "An Interrupted Duel," in that it contained far more variety of detail, more unmistakable feeling, and somewhat greater scope for difference of interpretation. Both pictures, however, contained more detail than could be exhausted by an attentive observation of thirty seconds. This test is very similar to that described by M. Binet in his article *La description d'un objet*,<sup>1</sup> the chief difference being that the picture—in this case exposed to the observation of children—represented a scene from a familiar fable, and the subjects were so informed before looking at it. The time of observation was two minutes, instead of thirty seconds.

<sup>1</sup> L'Année psychologique. Vol. III, pp. 296 ff.



The results from this test, as from those of imagination, seem to be mainly valuable as indicating certain individual types.

The second test under Observation is similar to the first and may be briefly dismissed as having in itself small value. A small colored card, representing a lady rather brilliantly dressed standing before a dressing table upon which reposed variously tinted bottles and boxes, was shown to the subject for the space of five seconds, after which he was requested to write down all the different colors he had observed on the card, together with the location of each. This test, like the first, may be reckoned one of observation rather than of memory, since the colors of the pictured card were not that to which attention would naturally be primarily directed; moreover, the colors were few and could easily be remembered if noticed. Hence the number of colors actually remembered was an indication of the degree in which they attracted the attention of the observer. Since, however, the experiment was given but once, the result could not be taken as showing a permanent attitude of mind.

The third test departed entirely from the sphere of sensible perception, and had to do with thought relations. A pair of synonyms was given to a subject, and he was allowed five minutes for writing down the distinction between the words in regard to their meaning and use. Six pairs of such words were given to the Junior class and seventeen to the advanced students.

#### VI. Taste and Tendencies.

Under this heading are grouped the remaining experiments, the object of which was to test in the several individuals the appreciation of the beautiful as expressed especially in art, music, and literature. In these tests the assumption is made that the taste for an art will carry along with it a knowledge of that which is universally conceded to be the best work in that sphere, as well as some knowledge of the authors of it. This seems to be a warrantable assumption, if we take into consideration the individuals tested; since all must have had opportunities (college libraries, magazines, etc.) to learn of that toward which their natural tastes directed them. Art, music, and literature form the basis for the investigation; art being taken in the restricted sense as comprising painting and sculpture.

1. *Art.* Three tests belong here. (a) For this test, a selection of twelve paintings was made from among those which are given the very highest place in that art. Photographic reproductions of these were used. A subject was given a photograph, and allowed five minutes for noting in writing five things: title, artist, school, and approximate date of the original, together with a brief description from the photograph itself. The paintings chosen were these: Raphael's *Sistine Madonna*, Michael Angelo's *Last Judgment*, Leonardo da Vinci's *Last Supper*, Rubens' *Descent from the Cross*, Correggio's *Holy Night*, Titian's *Assumption of the Virgin*, Murillo's *Immaculate Conception*, Rembrandt's *Night Watch*, Volterra's *Descent from the Cross*, Guido Reni's *Beatrice Cenci*, Velasquez' *Portrait of Himself*, and Guido Reni's *Aurora*. These photographs were given not only to the advanced subjects, but also to the members of the Junior class. As there was but one photograph of each painting, and as the time available was not sufficient to allow five minutes for considering each photograph, the experiment was performed upon the Juniors in this way. Each photograph was numbered upon the back, and all were distributed among the class, face downward. The experimenter then gave instructions, reading the questions (given above) to which answers should be written. A signal was then given: the subjects wrote



down at the head of a sheet of paper the number on the back of the photograph. Another signal, and the photographs were turned, and one full minute allowed for writing the answers. Then the photographs were passed on, from each student to the next, and the signals were repeated as before.

Tests (b) and (c), given to the advanced students only, consisted in allowing five minutes each for the subject to write (b) the names of as many noted pieces of sculpture as possible, and (c) the names of as many artists renowned in the sphere of painting or plastic art as could be written in the given time.

2. *Music.* Here the tests are similar in nature to those above. (a) The subject was required to name, on paper, as many musical composers of renown as possible in five minutes. (b) The subject, being given a list of ten musical composers, was required to name one composition or important class of composition produced by each. Five minutes was the allotted time for this also. The list of composers comprised the following: Mendelssohn, Beethoven, Chopin, Mozart, Wagner, Liszt, Schumann, Rubinstein, Handel, and Schubert. (c) The test previously described under the partial memory of sounds (power to remember and reproduce musical airs) has a bearing upon this part of our subject.

A modified form of these tests was given to the Juniors. They were required to write (1) a list of six musicians, (2) one production under each name, (3) the style of each, *i. e.*, his favorite form of composition, and (4) to answer the question: "What did Wagner introduce into Grand Opera?"

3. *Literature.* (a) Selections were chosen from eight prominent English prose writers, and read aloud to the subjects. After the reading of each, the subject wrote whom he considered to be the author of the selection, as well as the source of this judgment: whether memory of the particular passage, or inference drawn from the style or subject matter. The writers and selections were as follows: Macaulay, *The Progress of England*, from *Essays on Sir James Mackintosh*; Ruskin, *The Open Sky*, from *Modern Painters*; Bacon, *Of Studies*, from the *Essays*; Dickens, *Mrs. Gamp's Apartment*, from *Martin Chuzzlewit*; De Quincy, *A Wonderful Dream*, from *Confessions of an English Opium Eater*; Carlyle, *Labor*, from *Past and Present*; Thackeray, *Family Prayers*, from *The Newcomes*; and Scott, *Raleigh's First Interview with Queen Elizabeth*, from *Kenilworth*.

(b) Similar selections were chosen from eight English and American poets, and the test was performed in the same manner as the above. The subjects were informed that the poetry might be taken from either English or American writers. The passages selected were these: Wordsworth's *Ode to Immortality*, first two stanzas; Shakespeare's *Midsummer Night's Dream*, speech of Theseus on Imagination; Tennyson's *In Memoriam*, LIII; Milton's *Ode to His Blindness*; Browning's *Rabbi Ben Ezra*, stanza "Thou Fool!" etc.; Bryant's *To a Waterfowl*, last three stanzas; Holmes' *The Chambered Nautilus*, last two stanzas; and Spenser's *Fairy Queen* I, 4: 4, 5 (*The House of Pride*).

4. A further test of tastes and tendencies consisted in the questions put to the subjects as to the character of their favorite reading, their fondness for the opera, the play, and for reflective games such as whist, chess, etc. See above, under III.

### § 5. Results.

We have next to consider the results obtained from the tests that have been outlined. They may be considered from two

points of view, quantitatively and qualitatively. Some tests best lend themselves to a numerical expression of results, while the outcome of others must be estimated chiefly in terms of quality. Among the former are the tests of the first group, those upon memory.

### I. Memory.

1 and 2. *Memory of letters and memory of figures.* These may be considered together, since the tests were closely similar and performed in the same manner.

TABLE I.

SUBJECTS.	MEMORY OF LETTERS.		MEMORY OF FIGURES.	
	Average times exposed.	Fluctuation limits.	Average times exposed.	Fluctuation limits.
B.	(2) 3	1-6	(3) 2.9	1-4
G.	(1) 2.25	1-4	(1) 2.25	1-3
V. M.	(7) 4.95	2-12	(6) 3.7	2-5
W. M.	(3) 3.2	2-5	(2) 2.6	2-4
E. R.	(5) 3.9	3-6	(5) 3.5	2-5
L. R.	(6) 3.95	2-7	(7) 4.55	3-9
T.	(4) 3.3	1-6	(4) 3	2-4

Table I gives for each individual (1) the averages, taken from twenty experiments each of letters and figures, of the times necessary to expose a series of twelve before it is correctly repeated, and (2) the fluctuation limits, that is, the highest and the lowest number of exposures required for the memorizing of one series by the different individuals. The small figures in brackets at the left of the first and third columns indicate the order of the averages from the lowest to the highest, or the order of the individuals in regard to rapidity of memorizing from the most to the least rapid.

A comparison of the results from the last five experiments with letter series with those from the first five makes evident the effect of practice. In the last experiments also, the individual differences decreased. In the figure series the effect of practice in the last experiments was less apparent. This was, no doubt, partly due to the fact that the practice gained in the memorizing of letters facilitated the memorizing of the figures from the first.

A glance at Table I will show a certain correspondence between the order of averages for letters and that for figures. Where changes have taken place, it is between those individuals whose averages were contiguous. Thus, 2 and 3, and 6 and 7 changed places, but there is no

indication of a strongly developed partial memory for either letters or figures alone, on the part of any individual, which would make a radical difference in the order of averages for the two kinds of experiments. The Table shows, in general, a slightly better memory for figures than for letters, with one marked exception (*L. R.*). Memory of figures might have been easier for several reasons. The practice mentioned above, gained from the similar memorizing of letters, the permanent practice gained in the course of education, and the fact that figures, in whatever order, make an intelligible combination, all would contribute to greater ease in learning figures. In the case that shows a decided divergence from this rule, the cause probably lies in the fact that the subject tried to rely upon her visual memory, and that, as there was necessarily a recurrence of some figures in a series of twelve, the repetition tended to fatigue the attention and confuse the mind of the subject in regard to the order of the characters. The decrease in the variety of form doubtless made the figure series harder to remember than the letters. The Table shows not only a lowering in the averages for memory of figures, but a lowering, in the case of every individual but the one above excepted, of the upper limit of fluctuation.

The mode of memorizing the letters and figures used by the subjects, as learned from observing them and also from their own reports, shows no coincidence between any particular memory type and any special ability or disability for memorizing.

### 3. *Memory of words.*

TABLE II.

SUBJECTS.	B.	G.	V. M.	W. M.	E. R.	L. R.	T.
Av. per cent. of words re-produced in short series.	(5) 81.1	(2) 84.2	(3) 84.1	(6) 77.5	(7) 75.6	(4) 82.2	(1) 98.5
Av. per cent. of words re-produced in recapitulation.	(2) 34.6	(1) 54.3	(5) 27.9	(3) 34.1	(7) 19.0	(6) 27.5	(4) 29.6
Difference.	(3) 46.5	(1) 29.9	(5) 56.2	(2) 43.4	(6) 56.6	(4) 54.7	(7) 68.9

Table II gives on its first line the average percentage of words of short series which were immediately repeated by the subject after the series was read to him. The percentages represent for each individual the results obtained from four sets of seven short series each. The second line of the Table gives the average number of words mentioned

by each subject in recapitulating from memory as many as possible of the whole forty-nine words contained in a set of seven series of seven words each. The averages in this line were also made from four sets of such series. The third line of the Table gives the average percentage of loss sustained by the memory in the time intervening between the repetition of the short series and the recapitulation. The first line, then, indicates individual differences in the immediate memory of verbal sounds; the second line, individual differences in the memory of conservation; and the last line, individual differences in loss.

The words used in these tests were of varied character, comprising names of particular objects, qualities, virtues, general and abstract terms, in wholly disconnected order. The results showed no marked individual differences in the kind of words remembered. A fair proportion of the abstract terms were remembered by all the subjects. In general, the position of the words in the original series gave no clue to individual differences in the recapitulations. The words in the first and last parts of the sets were usually those best represented in the recapitulations of all the subjects. In the case of *T.*, however, the tendency to remember best the words in the last short series was more marked than in the others.

Table II shows in the first line an order among the individuals quite different from that observed in the previous Table. *T.*, who there held the fourth place, here stands far higher than any other; and *V. M.* and *L. R.* change from the sixth and seventh to the third and fourth places. This change is largely due to the fact that the remembered stimuli are auditory instead of visual. In the short series it was chiefly a succession of sounds that was remembered, as is attested by the fact that, where mistakes by substitution occurred, they were almost invariably of like-sounding words, such as *flower* for *floor*, or *furnish* for *furnace*; while, in the recapitulation, the errors are usually additional words suggested from analogy of sense, such as *dog* suggested by *cat*, *cold* by *winter*, and *accident* by *horror*. In the recapitulation, the order among the individuals returns very nearly to what it was in the first two tests.

#### 4. *Memory of Sentences.* (a) *Memory of Short Sentences.*

Table III gives under four headings the average percentages obtained from twenty sentences under each of the five groups. The sentences increase in abstractness from Group I to Group V. The average length of sentences under each group is given at the foot of the Table. The exact meaning of the four headings under which the percentages are classified has been before stated. The complete results from which these averages are drawn show for a single subject, in a single group of similar sentences (similar in regard to abstractness), fluctuations larger than the differences in the averages of widely separated groups. This is evidence of the complexity of the factors which enter into these experiments. The differences in the length of the sentences (though these are not large), the differences in construction, the use of words

TABLE III.

	GROUP I.				GROUP II.				GROUP III.				GROUP IV.				GROUP V.			
	AVERAGE PERCENTAGES.				AVERAGE PERCENTAGES.				AVERAGE PERCENTAGES.				AVERAGE PERCENTAGES.				AVERAGE PERCENTAGES.			
	Verbal Accuracy.	Order.	Sense.	Certainty.	Verbal Accuracy.	Order.	Sense.	Certainty.	Verbal Accuracy.	Order.	Sense.	Certainty.	Verbal Accuracy.	Order.	Sense.	Certainty.	Verbal Accuracy.	Order.	Sense.	Certainty.
B.	84.9	98.8	88.6	94.5	80.5	98.9	95.3	91.0	78.7	99.1	85.7	90.2	74.4	97.6	87.1	88.7	73.5	96.2	83.7	89.0
G.	93.5	99.0	96.4	98.3	94.5	99.6	99.6	97.5	88.3	99.8	97.0	98.2	87.3	98.4	95.8	97.1	92.1	98.8	99.4	97.4
V. M.	88.1	99.0	94.5	98.4	94.3	99.5	97.8	98.5	90.7	99.4	96.1	97.4	87.2	99.4	94.6	98.6	82.0	97.1	88.1	94.2
W. M.	84.5	98.4	90.6	97.8	87.8	98.9	90.4	97.5	85.3	98.6	86.8	96.5	83.6	99.3	92.2	96.5	79.4	98.4	86.8	97.6
E. R.	76.9	98.2	84.2	97.3	85.3	97.5	83.3	95.5	69.6	97.9	83.2	85.3	82.0	98.1	85.3	82.3	70.9	97.9	83.4	88.7
L. R.	88.4	98.6	93.5	95.5	89.5	99.7	97.5	96.8	84.6	99.2	91.5	93.8	73.2	98.3	93.8	94.0	81.3	98.4	81.2	92.6
T.	96.5	100.0	97.3	99.1	97.5	100.0	97.7	98.7	94.7	100.0	92.7	99.3	95.0	99.6	98.8	97.7	94.5	99.0	95.4	97.5
	Av. length of sentences = 24½ words.				Av. length of sentences = 23½ words.				Av. length of sentences = 25½ words.				Av. length of sentences = 24½ words.				Av. length of sentences = 24½ words.			

which may chance to be somewhat unfamiliar to the subject, and, perhaps, more important than all, the varying subjective conditions under which the experiments are performed, produce results of more varying character than those which come from differences in the abstractness of the sentences. One page from the original results, chosen at random, will show the lack of constancy in the averages under any one group of sentences.

*Specimen Page of Original Results.*

SUBJECT B.

Sentences.	% Verbal Accu- racy.	% Order.	% Sense.	% Cer- tainty.	Sentences.	% Verbal Accu- racy.	% Order.	% Sense.	% Cer- tainty.
1, III, 22	100.0	95.5	100.0	93.2	1, IV, 22	100.0	100.0	100.0	93.2
2, III, 23	83.1	100.0	69.6	93.5	2, IV, 22	77.3	100.0	86.4	95.5
3, III, 23	95.7	100.0	100.0	91.4	3, IV, 23	95.7	100.0	100.0	100.0
4, III, 24	87.5	100.0	95.9	95.9	4, IV, 23	95.7	100.0	100.0	97.9
5, III, 24	95.9	100.0	100.0	93.8	5, IV, 23	100.0	100.0	100.0	95.7
6, III, 24	62.9	100.0	75.0	100.0	6, IV, 23	67.4	95.7	91.4	93.5
7, III, 24	95.9	100.0	100.0	98.0	7, IV, 24	83.4	95.9	87.5	98.0
8, III, 25	50.0	100.0	78.3	96.0	8, IV, 24	83.4	100.0	83.4	93.8
9, III, 25	86.0	100.0	100.0	93.5	9, IV, 24	83.4	95.9	87.5	95.9
10, III, 25	84.0	100.0	84.0	98.0	10, IV, 25	40.0	92.0	72.0	74.0
11, III, 25	86.0	96.0	92.0	76.0	11, IV, 25	56.0	96.0	76.0	92.0
12, III, 25	80.0	100.0	100.0	90.0	12, IV, 25	56.0	92.0	56.0	76.0
13, III, 25	76.0	100.0	88.0	90.0	13, IV, 25	96.0	100.0	100.0	90.0
14, III, 26	79.3	100.0	100.0	84.7	14, IV, 25	92.0	100.0	92.0	96.0
15, III, 26	96.6	100.0	100.0	94.3	15, IV, 25	80.0	96.0	92.0	92.0
16, III, 26	80.8	100.0	84.7	98.1	16, IV, 25	77.0	96.0	100.0	100.0
17, III, 27	70.4	100.0	100.0	100.0	17, IV, 26	88.5	100.0	96.1	96.1
18, III, 28	82.2	96.5	96.5	92.9	18, IV, 26	61.6	100.0	96.1	94.3
19, III, 28	89.3	100.0	100.0	94.7	19, IV, 27	77.8	96.3	100.0	88.9
20, III, 28	92.9	100.0	100.0	100.0	20, IV, 28	57.2	96.5	85.8	91.2
Average	78.7	99.1	85.7	90.2		74.4	97.6	87.1	88.7

The results from sentences given to the Juniors show precisely the same characteristics, and hence will not be given here.

Table III shows that the columns headed *order* of words and degree of *certainty* of the subject indicate small differences between the individuals in these respects, although in the groups of the more abstract sentences individual differences in regard to the certainty of memory increase. Again, slighter individual differences are seen in *sense* than in *verbal accuracy*, the former being very frequently preserved when the latter is at fault. Considering, then, the verbal accuracy alone, we find, except in the case of one subject, that there is no constant lowering of the percentages as the sentences become more abstract. Between contiguous groups of sentences, where differences in concreteness or abstractness are slight, the length of the sentences appears to have a



decided influence. For example, all subjects but one (*B.*) have a higher percentage of verbal accuracy for Group II, which averages shorter sentences, than for Group I; while in Group III, whose sentences average longer than those of Group I, there is a lowering of the percentages for verbal accuracy on the part of each subject. A just comparison of the individual differences in the different groups should, however, take into consideration all of the four headings for marking. It may be made from Table IV, which gives the averages of the four percentages for each individual under each group, as well as the general average from all the percentages of all the sentences.

TABLE IV.

	I	II	III	IV	V	General.
	%	%	%	%	%	%
<i>B.</i>	<sup>6</sup> 91.7	<sup>6</sup> 91.4	<sup>5</sup> 90.9	<sup>6</sup> 86.9	<sup>6</sup> 85.6	<sup>6</sup> 89.2
<i>G.</i>	<sup>2</sup> 96.8	<sup>2</sup> 97.8	<sup>3</sup> 95.8	<sup>3</sup> 94.7	<sup>1</sup> 96.7	<sup>2</sup> 96.4
<i>V. M.</i>	<sup>3</sup> 95.0	<sup>3</sup> 97.5	<sup>2</sup> 95.9	<sup>2</sup> 94.9	<sup>4</sup> 90.4	<sup>3</sup> 94.7
<i>W. M.</i>	<sup>5</sup> 92.8	<sup>5</sup> 93.7	<sup>6</sup> 90.6	<sup>4</sup> 92.9	<sup>3</sup> 90.5	<sup>5</sup> 92.1
<i>E. R.</i>	<sup>7</sup> 89.1	<sup>7</sup> 90.4	<sup>7</sup> 84.0	<sup>6</sup> 86.9	<sup>7</sup> 85.2	<sup>7</sup> 87.1
<i>L. R.</i>	<sup>4</sup> 94.0	<sup>4</sup> 95.9	<sup>4</sup> 92.3	<sup>5</sup> 89.8	<sup>5</sup> 88.4	<sup>4</sup> 92.0
<i>T.</i>	<sup>1</sup> 98.2	<sup>1</sup> 98.5	<sup>1</sup> 96.7	<sup>1</sup> 97.7	<sup>2</sup> 96.6	<sup>1</sup> 97.5

In Table IV several things may be noted. Every individual (except *B.*, whose I and II figures are practically equal,) attained his highest percentage in Group II, that which averages the shortest sentences. The position of the lowest percentages varies with the individuals. For *T.* and *W. M.*, this percentage is practically the same in Group III, which averages the longest sentences, and in Group V, which contains the most abstract sentences: a slight difference in lowness being in favor of the latter. For *E. R.* the percentage shows that it is Group III which is most difficult, while for *B.*, *V. M.*, and *L. R.*, it is Group V. The remaining subject, *G.*, has her lowest average, strange to say, in Group IV, which is intermediate both as to length and abstractness between III and V. For all subjects, however, the percentage in Group V is lower than in Group I, the amount of the difference varying in the individuals as follows: *B.*, 6.1%; *G.*, 0.1%; *V. M.*, 4.6%; *W. M.*, 1.3%; *E. R.*, 3.9%; *L. R.*, 5.6%; and *T.*, 1.6%.

In regard to the order in which the individuals stand in the different groups, as indicated by the small figures in the Table, it will be seen that no subject keeps the same order throughout. *T.* shows the greatest constancy. The subjects may, however, be grouped in a general way. *T.*, *G.*, and *V. M.* hold the first three places; *W. M.* and *L. R.* connect, and *B.* and *E. R.* last. This grouping agrees, too, with the order of results in the general averages.

If the order seen in the last column of Table IV be compared with that observed in Tables I and II,—that is, the order of the subjects in regard to memory of letters, figures, and words,—it will be found that the former approaches most nearly the order in the immediate memory for words. In the test of sentences, as in that of words, the stimuli were auditory impressions, to be reproduced immediately after dictation. In the case of sentences, however, the sense of the words had much more influence; for although the words were read by the experimenter very monotonously, as if they formed an unconnected list, and the interpretation was left to the subject, yet this, when made, could not but prove a material aid to the memory. For both these reasons the order is very different from that observed in the memory for letters and for figures, while only slightly different from that for the immediate memory for words.

Considering the test in general, it may be said that, in sentences of the length here used, abstract sentences are very little more difficult than concrete for any of the subjects (including the Juniors). Moreover, in regard to the availability of the test, the results shown are of too meager and indecisive a character to be at all in proportion to the time and labor necessary for the selection, classification and correction of the sentences.

(b) Memory of Long Sentences.

Table V gives in full the results, for the advanced students only, of the test of long sentences, where two sentences are given for each of the five degrees of abstractness. A word should be said in regard to the categories under which the marking is made. The number of words forgotten means only those which have entirely dropped out from the memory, those for which no substitution, even though inaccurate, is made. The number of groups retained embraces only those in which there is absolutely no change in verbal form. The 'number of synonyms' means the number of words in the original passage for which synonymous words or phrases are substituted. These substitutions may have a more contracted or expanded form than the original, but contractions are by far the more numerous. The fourth category, 'number of substitutions,' means the number of words in the original passage which are represented in the reproduction, but not with sufficient accuracy to be classed as synonymous substitutions, *plus* the words in the reproductions which have no counterparts in the original passage. Substituted forms may be words which mean something different from the original, although related to it by analogy; or they

may be whole sentences or parts of sentences which express fairly well the main idea of the original, while ignoring all minor points of significance, and with an entire change of syntax and verbal form; or, again, they may consist in the addition of words not found in the

TABLE V.

	A. I. 52 words, 23 groups.				A. II. 58 words, 15 groups.				A. III. 64 words, 23 groups.				A. IV. 57 words, 15 groups.				A. V. 51 words, 21 groups.			
	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of
B.	15	12	0	12	21	7	0	6	25	2	0	22	21	3	0	14	17	2	15	7
G.	22	8	4	4	1	14	0	0	4	18	3	1	1	10	5	3	46	3	0	0
V. M.	16	5	2	2	8	3	14	4	16	8	11	11	23	3	3	11	17	2	11	6
W. M.	4	15	1	11	20	5	4	1	12	5	23	5	29	4	0	4	39	3	5	1
E. R.	13	16	2	6	10	1	3	32	12	1	3	40	6	1	10	23	14	3	5	20
L. R.	10	15	6	1	10	4	3	7	17	1	11	25	8	5	7	2	2	3	3	23
T.	24	12	1	0	9	12	1	0	12	9	0	11	10	8	1	4	8	6	2	16

	B. I. 55 words, 24 groups.				B. II. 57 words, 17 groups.				B. III. 63 words, 24 groups.				B. IV. 59 words, 21 groups.				B. V. 59 words, 21 groups.			
	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of	No. of words forgotten.	No. of groups retained.	Synonyms. No. of	Substitutions. No. of
B.	16	10	4	7	10	8	4	10	30	10	2	4	7	10	1	11	4	6	7	28
G.	2	22	3	2	1	12	5	3	1	15	12	3	7	12	3	5	26	7	1	5
V. M.	7	19	0	3	9	11	3	0	19	6	4	4	9	5	6	20	32	5	13	14
W. M.	21	10	0	3	6	12	1	2	15	9	5	5	11	11	6	18	22	5	13	14
E. R.	16	13	3	3	9	4	3	26	33	6	0	20	11	2	0	0	15	4	11	36
L. R.	8	17	7	3	7	11	2	1	8	10	8	11	21	4	1	18	15	4	12	1
T.	6	20	3	1	3	9	4	3	5	6	5	6	7	10	1	11	0	2	10	26
Tot'ls	150	219	46	59	124	113	47	95	229	102	87	169	171	88	38	136	254	51	86	188

original. The latter kind is not of frequent occurrence. It will be seen that the Table does not represent the results precisely. It gives the number of words *for* which substitutions are made, but not the

number of words substituted; neither does it tell just *how* closely the latter conform to the former in meaning. The four categories employed seem, however, to be those most practicable for marking the sentences employed in this test.

Table V shows that here, as in the preceding test, there is a considerable lack of constancy in the results. The memory of long sentences requires a high degree of attention on the part of the subject, and any accidental subjective condition which may serve to distract him will produce an effect on the results which no consideration of the objective conditions can account for. The same individuals show often a wide discrepancy of results between two sentences of the same degree of abstractness and of almost the same length and number of words. The totals, however, show here, as in the test with short sentences, that the most abstract sentences are more difficult to remember than the concrete. The total number of groups retained steadily decreases from I to V. The total number of words completely forgotten is considerably greater in V than in I, although in length the sentences do not greatly differ. In III, where the sentences are long, the number of words forgotten is almost as great as in V; a result which also agrees well with that observed in the previous experiment. In general, the number of synonyms increases as the sentences become more abstract, and the number of substitutions increases in even larger proportion.

TABLE VI.

	Number of words forgotten in all the sentences	Number of groups retained in all the sen- tences.	Number of syn- onyms in all the sentences.	Number of sub- stitutions in all the sentences.
B.	6. <b>166</b>	6. 70	6. 33	2. 121
G.	1. 89	1. <b>134</b>	5. 36	7. 26
V. M.	5. <b>148</b>	3. 79	1. 60	5. 66
W. M.	7. <b>179</b>	4. 78	3. 58	6. 49
E. R.	4. 124	7. 45	4. 40	1. <b>224</b>
L. R.	3. <b>118</b>	5. 78	2. 59	3. 94
T.	2. <b>104</b>	2. 93	7. 28	4. 78

Table VI shows a summary of results. It gives for each subject the total number of words forgotten, groups retained, etc. Individual characteristics here manifest themselves. For *B.* this characteristic is the large number of words completely forgotten, for *G.* the large number of groups accurately remembered, for *E. R.* the large number of substitutions; while for the remaining subjects the number of words completely forgotten seems the most prominent characteristic.

Several things are to be noted in regard to the order as indicated by the small figures. The order in the number of groups retained is the same as in the general averages for memory of sentences, with the exception that *T.* and *G.* have changed their places as 1 and 2 respectively. It has been seen that *T.* excelled when immediate auditory memory was called into play. Here the sentences are so much longer than the preceding ones that the auditory memory has been forced into greater subservience to the memory of ideas, and hence the loss of rank follows. That the order in columns 1 and 2 differs considerably arises from the fact that, where groups are not exactly retained, they need not all be dropped out, but may be expressed, with more or less exactness, in a different verbal form. It is to be noticed, also, that the order in column 4 and that in column 2 are almost precisely reversed; that is, those who have retained the greatest number of groups have employed the least number of substitutions, and *vice versa*. All this throws some light upon the relative reliability of the memory in the subjects tested. *G.* shows not only the largest number of groups retained and smallest number of forgotten words, but also a preponderance of synonymous words over substitutions. *W. M.*, whose number of forgotten words is large, has also a preponderance of synonyms over substitutions. In all other cases the substitutions outnumber the synonyms. This is markedly the case for *E. R.*; *B.* shows the same characteristic in a lesser, but still large, degree. Both kinds of changes in expression result from what Mm. Binet and Henri call 'verbal assimilation.' The subject gives to a passage, as it enters his mind, the stamp of his own personality, imparts to it his own habits of thought.

#### 5. Memory of Musical Sounds.

The responses to the three questions: (1) Can you carry an air at all? (2) Can you reproduce an air after hearing it once? In your head? By whistling or singing? and (3) How accurate is your reproduction (if it has been tested)?—have been tabulated for the advanced students as follows.

TABLE VII.

	Carry Air?	Reproduce after single audition.		Accurate?
		Mentally?	Physically?	
B.	Yes.	Seldom.	No.	Not tested.
G.	Yes.	No.	No.	Only after learning.
V. M.	Yes.	Often.	Partially.	{ Mental reproduction accu- rate. Physical, not.
W. M.	Yes.	Partially.	Partially.	Fairly accurate.
E. R.	Yes.	Yes.	Sometimes.	Not tested.
L. R.	Yes.	Partially.	Partially.	Yes.
T.	Yes.	Partially.	Partially.	Yes.

The memory for musical sounds cannot be compared with that for letters, figures, etc., since no direct test was given for the former. The answers above tabulated are, moreover, not sufficiently precise to warrant any exact comparison between the individuals in regard to the readiness and accuracy of their musical memory. All that can be said is that *B.* and *G.* appear to fall within a different group from the other subjects. That musical memory is something quite distinct from mere auditory imaging is shown by a comparison of *G.*'s line in this Table with the corresponding line in Table VIII.

## II. Mental Images.

Letter Squares.—In this test the errors made are intended to form the basis of a judgment in regard to the kind of mental images employed by the subjects in their reproduction of printed letters. The largest error, however, lay throughout in incompleteness; that is, the omissions far outnumbered the actual mistakes. Again: the number of right letters placed in the wrong squares exceeded greatly the number of wrong letters, *i. e.*, of letters which did not appear on the printed card at all. The omissions are, for the most part, non-committal as regards mental images; the errors of position are often equally so; while the wrong letters used do not invariably make the kind of images a matter free from doubt. The subject's report of introspection, therefore, which accompanied each experiment, is of great value, and, when considered along with the errors made, may be taken as giving reliable information. A summary of the information thus gained may be given as follows.

TABLE VIII.

- B. *Visual* images most prominent, *motor* next, and *auditory* least.
- G. *Auditory* and *motor* images prominent, *visual* very slight.
- V. M. *Visual* very prominent, *motor* next, and *auditory* least.
- W. M. *Visual* very prominent, *auditory* and *motor* both important.
- E. R. *Motor* most prominent, *auditory* next, *visual* rarely present.
- L. R. *Motor* and *auditory* prominent, *visual* slight.
- T. *Auditory* and *motor* images prominent, *visual* slight.

One of the most noticeable characteristics shown by the introspective reports is that, in the case of one subject (*L. R.*), the letters were rarely remembered directly, but usually through a verbal association formed at the sight of the printed card, this verbal association being in tactual and auditory terms. Other subjects sometimes used verbal associations to aid the memory, but to a much less extent. The indirect method was, however, common among the Juniors. The answers obtained from questioning the subjects in connection with the tests for memory of words, letters, and figures, confirm the conclusions in the above summary. Beside these questions each subject was requested to state where, in his opinion, he should be placed under the degrees of mental imagery (visual imagery) as classified by Francis



Galton in his *Inquiries into Human Faculty*, p. 93. This classification was made from responses received from a large number of individuals questioned in regard to the illumination, definition, and coloring of their mental images. The classification is in full as follows:

*Degrees of Mental Imagery.* *Highest.*—Brilliant, distinct, never blotchy.

*First Suboctile.* The image once seen is perfectly clear and bright.

*First Octile.* I can see my breakfast table or any equally familiar thing with my mind's eye quite as well in all particulars as I can do if the reality is before me.

*First Quartile.* Fairly clear; illumination of actual scene is fairly represented. Well defined. Parts do not obtrude themselves, but attention has to be directed to different points in succession to call up the whole.

*Middlemost.* Fairly clear. Brightness probably at least from one-half to two-thirds of the original. Definition varies much, one or two objects being much more distinct than the others, but the latter come out clearly if attention be paid to them.

*Last Quartile.* Dim, certainly not comparable to the actual scene. I have to think separately of the several things on the table to bring them clearly before the mind's eye, and when I think of some things the others fade away in confusion.

*Last Octile.* Dim, and not comparable in brightness to the real scene. Badly defined, with blotches of light; very incomplete; very little of an object is seen at one time.

*Last Suboctile.* I am very rarely able to recall any object whatever with any sort of distinctness. Very occasionally an object or image will recall itself, but even then it is more like a generalized image than an individual one. I seem to be almost devoid of visualizing power as under control.

*Lowest.* My powers are zero. To my consciousness there is almost no association of memory with objective visual impressions. I recollect the table, but do not see it.

Below is given the result of the self-classification of our seven subjects under the above divisions.

B.	G.	V. M.	W. M.	E. R.	L. R.	T.
First Octile or possibly first Quartile.	Last Octile.	First Octile.	First Octile.	Last Suboctile.	Last Quartile.	Last Quartile or possibly middlemost.

This result also agrees admirably with that given in the summary above.

### III. *Imagination.*

1. *Passive Imagination.* (a) Method of Blots. The results obtained from the experiments under this method are susceptible of quantitative expression, but their qualitative aspect is of equal, if not greater, importance. The numerical results are given in Table IX, in which is shown, for each subject, the number of objects seen in each of the ten different blots, and the number of their sum.

The small figures at the left of the last column in Table IX indicate the order of the subjects in respect to the readiness of their flow of ideas,

TABLE IX.  
*Number of Objects seen in Blots.*

	BLOT I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	TOTAL.
B.	5	7	8	5	9	1	5	14	14	13	81
G.	1	4	4	6	5	2	4	3	3	6	38
V. M.	6	6	10	6	6	5	7	8	8	6	68
W. M.	4	3	3	1	4	3	2	3	3	1	27
E. R.	4	4	5	3	6	1	5	4	2	3	37
L. R.	6	8	7	6	6	7	8	6	6	10	70
T.	3	5	4	6	3	6	5	9	8	6	55

or the relative number of associative connections which are at the immediate command of the subjects. The *kind* of associations peculiar to the various individuals must, however, also be considered. The associated objects most frequently mentioned are animals; familiar fruits, plants, tools, household utensils, etc.; scientific objects such as geometric figures, mathematical symbols, schematic drawings, maps, etc.; objects suggested by literary reminiscence; and finally, objects from fable and mythology, such as monsters, fairies, witches, satyrs and centaurs. *B.*, who stands first in regard to number of objects seen in the blots, holds also a high place in respect to variety, since his reports show not only the names of animals and familiar objects, but associations derived from science and a few from mythology. *E. R.* and *M. W.*, who occupy a low position in respect to number of associations, have a corresponding place in regard to variety, since the associations are restricted almost exclusively to names of animals and familiar objects. Of the other subjects, *V. M.* and *L. R.* have shown a somewhat greater variety than *G.* and *T.*, especially in the way of fable and literary reminiscence. These differences in variety may be called the individual differences in regard to the source from which associations are habitually drawn. The reports from this test, however, show further peculiarities,—individual differences which, in general, subsist between single associations, and differences in the manner of reporting all the associations. For example: a particular blot may call up in the mind of a subject, through association, a number of objects similar to this in form, and he enumerates the objects one after another; while to another individual the same blot seems filled with pictures representing some action or situation, which are reported, often with touches of fancy or sentiment. This difference in the reports is sufficiently marked and sufficiently constant to form a basis for the classification of the individuals into two classes: one class rep-

representing the *constructive* or imaginative type, characterized by the putting together of concrete details in such a way as to form a significant whole; the other class, representing what may be called a *matter-of-fact* or scientific type, characterized by a process more purely analytic in its nature. The following reports from three subjects on Blot IX may serve to make plain the characteristic difference.

1. *Associations few and non-constructive.*

An eagle. Stuffed turkey. Head and neck of a musk-rat.

2. *Associations many and varied, but non-constructive.*

Ghost. Tadpole. Lizard. Ichthyosaurus. Mountains. Wigwama. Totem poles. A plain. A monument. Rocks. Pine trees. Sphinx. Satyr's head. Unknown animal (similar to giraffe).

3. *Associations numerous and constructive.*

Giraffe. Prehistoric bird in flight. Fairy riding on a humble-bee. Bit of tropical jungle, with trailing gray mosses and pools of water. Japanese lady. Bit of landscape with two hills and a valley between—an army encamped under one hill. Moss-grown log floating in water. Fabulous monster (griffin perhaps), walking off on his hind legs with a small Hottentot under his arm.

The constructive tendency is most prominent in *V. M.* and *L. R.* who also, next to *B.*, stand first in point of number and variety of associations; it is plainly discernible in *G.* and *T.*, though to a less degree in the latter than in the former; *B.*, *E. R.*, and *W. M.* must be classed as belonging to the other type.

(b) Test of associations with abstract terms, number forms, etc. None of the subjects had fixed associations with abstract terms, not even those subjects who are remarkably good visualizers. That this is the case tends to confirm the fact, observed by Galton, that persons dealing with highly generalized or abstract ideas habitually suppress any mental imagery that may tend to arise with them, and thus the very tendency disappears. No elaborate forms for the mental arrangement of number was reported by any of the subjects. *B.*, however, arranges the months in a vague circle with winter on the top and summer opposite; and *G.*, who has a color association with all words, letters, and figures, has extra and especial colors for the seasons, which take the form of disks arranged on the circumference of a circle. The latter fact is noticeable because the subject, apart from these color associations, visualizes very little.

2. *Constructive Imagination.* (a) Mechanical Imagination. The tests under this heading were two, the Magic Box and the Puzzle Watch. It will be remembered that the two points of explanation which the subjects should have given in regard to the first were the magnetized pivot, and the inner mechanism of gearing and fly wheel connected with the side-arm by means of which the impulse was given. The explanation of the Puzzle Watch lay in the connection of hands and works by means of an inner glass revolving disk and the regulation of the relative movement of the hands by means of tiny gearings in the central pivot. The explanations given by the different subjects may be tabulated as follows.

TABLE X.

*Magic Box.**Puzzle Watch.*

B.	1. Magnetized pivot. 2. Coiled spring inside released by lever pushed in.	First hypothesis, hands moved by magnetism, corrected in favor of second hypothesis: a plate of glass revolving with hands and a little system of cogs for relative motion.
G.	1. Alternate attraction and repulsion by electric current through pivot. 2. Electric battery inside; circuit closed by lever.	Perhaps hands were magnetized in some unknown way.
V. M.	No explanation.	Perhaps the hands were magnetized.
W. M.	1. Magnetized pivot. 2. Spiral spring inside.	Three hypotheses. First was perfectly correct. Second (which he preferred), invisible wire connection. Third (preferred to either), magnetization.
E. R.	1. Magnetized pivot. 2. Some kind of clock work inside.	Two inner glass disks, one revolving with pivot of minute hand and other with hour hand.
L. R.	1. Magnetized pivot. 2. Coiled spring inside tightened by pulling lever out.	No explanation.
T.	1. Attraction exerted through lid of the box by 2. A magnet inside made to move about in some way.	Suggested magnetism, but failed to see how it could be made to work.

In the first test the explanations given by *B.*, *W. M.*, and *L. R.*, are almost identical, while that of *E. R.* is similar but more indefinite. *T.* and *G.* come next in order with explanations which show that the correct idea is more nearly grasped by the former, while *V. M.* gives no explanation at all. In the second test, *B.*, after giving the hypothesis which suggested itself to nearly all the subjects (magnetism), changed this in favor of the correct explanation; while *W. M.*, who gave the correct explanation first, afterwards preferred to it two other erroneous hypotheses. *E. R.* gave properly the main idea of the explanation. A noticeable difference in the reports of the two tests is that *L. R.*, who gave one of the best explanations of the Magic Box, could offer no suggestion in regard to the Puzzle Watch. *T.*, *G.*, and *V. M.*, whose reports were on slightly different levels in the first test, all suggest the same vague hypothesis in the second. Taking into consideration the reports from both tests, and especially the lapse on the part of *L. R.*, it may be said in general that the subjects most proficient in mechanical inventions are *B.*, *W. M.*, and *E. R.*, a group which coincides with that classed in a previous test as belonging to the matter-of-fact or scientific type, a type showing analytical tendencies. The process here was mainly one of analysis; the coincidence in the grouping, therefore, is one that might have been expected. The classification of the subjects into two groups, with *B.*, *W. M.*, and *E. R.* on the one side and *V. M.*, *T.*, *G.*, and *L. R.* on the other, is also a

grouping according to sex. This may be significant, owing to the fact that men are, as a rule, more familiar with mechanical devices than women.

(b) Literary Imagination. (1) Development of sentences.

TABLE XI.

	Sentences developed using given substantives.		Sentences developed using given verbs.	
	Average number of sentences developed from one group of words.	Average quality of the sentences.	Average number of sentences developed from one group of words.	Average quality of the sentences.
B.	6.	5.	6.	5.
	3.5	56	2.6	67
G.	2.	4.	2.	4.
	5.8	68	5.4	71
V. M.	4.	2.	4.	2.
	4.5	108	3.4	129
W. M.	5.	6.	5.	6.
	3.7	55	2.8	69
E. R.	7.	7.	7.	7.
	3.2	49	2.5	54
L. R.	3.	3.	3.	3.
	4.9	105	4.4	128
T.	1.	1.	1.	1.
	6.6	113	5.8	133

Table XI gives averages obtained from ten experiments with substantives and ten with verbs, five minutes being the time allotted for the development of sentences in each experiment. The columns of the Table headed *quality* demand some explanation. In general, quality stands for the degree of elaboration of the sentences, taking into consideration the length, rhetorical form, and especially the range of ideas expressed in a single sentence or in a series of sentences formed by the use of the same 'given' words. The sentences made showed three distinct degrees or stages of elaboration, which may be designated by *A*, *B*, and *C*, and smaller degrees of difference, intermediate between, or shading into these, which may be represented by the symbols of *plus* and *minus*. Sentences in which the three 'given' words were connected into a sentence by the use of as few words or ideas as possible were classed as *A*. Sentences which, by the addition of supplementary ideas, were more complete and definite in themselves, or which implied a context, were classed as *B*; while *C* was taken to designate those sentences in which the ideas were still further supplemented, and the literary form was correspondingly of a somewhat more elaborate character. For convenience in making averages, a numerical value was placed upon each of these symbols as follows:  $A=50$ ,  $A-=40$  and  $A+=60$ ;  $B=100$ ,  $B-=80$  and  $B+=120$ ;  $C=200$ ,  $C-=160$  and  $C+=240$ . According to this evaluation it will be seen from the Table that *B*'s sentences from

substantives average in quality between  $A$  and  $A+$ , and his sentences from verbs average between  $A+$  and  $B-$ . The other numbers under 'quality' are to be similarly interpreted. An instance of a sentence under each of the three main headings may serve to make the distinction between them more apparent.

Sentences formed by the use of the substantives, *citizen*, *horse*, *decree*.

*A*. "Decrees are made for citizens not for horses." (The connection of the words here is simple and mechanical.)

*B*. "That stalwart citizen on the great gray horse is a man to be trusted with the decree." (This implies a concrete situation.)

*C*. "All the well-to-do citizens of the village, each mounted on a horse, rode through the streets, proclaiming their dissatisfaction with the new decree." (A situation is here more fully outlined.)

A brief glance at Table XI shows two things: first, that every subject averages fewer sentences composed from 'given' verbs than from 'given' substantives; and, secondly, that every subject averages higher in quality in the latter than in the former. The reason for both facts lies in the greater definiteness with which the substantives determine the sentences: it is comparatively easy to make numerous sentences from definite substantives by changing the verbal connections, but it is difficult thus to change the entire character of the different sentences. The order that subsists among the individuals in regard to number of sentences is the same under substantives and under verbs, while the order in respect to quality is likewise the same under the two headings. If the order under number and under quality be compared, it will be seen that for three subjects, *T*, *L. R.*, and *E. R.*, the order remains the same, at 1, 3 and 7 respectively, both for substantives and for verbs; while, for the other subjects, the order is not radically changed. In general, then, the subjects who made the most sentences also made the most elaborate, and those who made the fewest sentences made also the simplest and most unimaginative. If the subjects are grouped according to their order in regard to number and also in regard to quality, the groups will be found to agree with those observed under the Method of Blots. The group which there showed a tendency toward constructive imagination, here show the same tendency, by their superiority in constructing sentences both as regards number and quality; while those who there showed a comparative lack of that tendency, here manifest the same characteristic by their lower rank in the construction of sentences. Within the constructive group *T*. has in this test advanced to the first place, showing that, to her mind, words possess a suggestiveness superior to that of mere visual outlines.

## (2) Development of a theme.

The only quantitative estimate that can be satisfactorily made in this test is the average number of words which a subject uses in the development of a theme: the number of words corresponding roughly with the number of ideas presented. The average number of words



used by the various subjects in developing three themes by narration or description, and three by exposition are given below.

TABLE XII.

	B.	G.	V. M.	W. M.	E. R.	L. R.	T.
Narration or descrip- tion.	7. 124	5. 155	2. 179	3. 174	6. 150	1. 259	4. 173
Exposition.	7. 94	5. 138	3. 159	4. 147	6. 120	1. 222	2. 184

It may here be seen that all the subjects, save one, write longer themes on imaginative topics than on those requiring the treatment by exposition; that is, the topics which have to do with concrete things seem to lend themselves to more spontaneous expression than do the topics which involve the activity of the more purely intellectual processes. *T.* forms the marked exception. To judge from the length of her themes, those of exposition seem to be composed with even greater readiness than the narratives. The order subsisting among the individuals in regard to length of themes is slightly different in the two kinds of writing. This is due, however, to the exceptional difference in length on the part of *T.*; if this were left out of account, the order among the subjects would remain the same in the two cases. A comparison of this order with that in regard to the average number of sentences constructed by the different subjects (see Table XI) shows, as the most striking difference, that here *W. M.* has advanced to a position in the first group, while *G.* has fallen from the second to the fifth place. There are also smaller differences in the order among the individuals in the two groups. These alterations in the order are not of themselves, however, sufficient to warrant a change in the classification of the individuals by imaginative type. The qualitative differences in the themes must also be taken into account.

Narration and description deal with particulars, not with generalization. This imposes on both the same task of seeking out those parts and characteristics of the object which are most individual, most unlike those of the class to which it belongs; all the details chosen are selected with a view to bringing out this unique character of the whole object or event. The material is concrete, the process is mainly synthetic. Exposition, on the other hand is invention dealing with notions or generalized ideas; its business is to set forth the meaning of things, to make clear their nature, scope, and relations. "Exposition is thus," in the words of Prof. Genung, "the handmaid of all accurate and clearly-cut thought." Narration and description demand vividness or picturesqueness of diction, and a certain dramatic force; exposition calls only for clearness and simplicity.

An attentive perusal of the particular themes under consideration with the above qualifications in mind shows, in regard to the imaginative themes, constant individual differences. *L. R.*, *T.*, and *V. M.* here, as before, belonging to the constructive type, exhibit in the highest degree the requisite qualities of concreteness, vividness, etc. *B.* and *G.* seem to be on substantially the same level, their themes being less vivid, more matter-of-fact, with a tendency to generalize the scene or event, and with very slight emotional coloring; the themes of *E. R.* and *W. M.* show these characteristics to a more marked degree. The other set of themes, those dealing with exposition, gives little clue to individual differences, partly because the topics themselves are not such as to admit of very wide choice in the matter of treatment, and partly because the long course of intellectual training which all the subjects had enjoyed tended to lessen, in this sphere, the differences due to mental constitution.

(3) Choice of Topic.

TABLE XIII.

	In a Snowstorm.	A Polar Landscape.	A Puritan Sabbath.	My Opposite Neighbor.	Man Hindowed with the Power of Flight.	Civilization not Regeneration.	Wisdom in Charity.	Friendship of Books.	Fiction as a Vehicle of Truth.	The Eloquence of the Bar and that of the Pulpit.
B.				X		X	X		X	
G.			X		X	X	X		X	
V. M.			X	X		X	X		X	X
W. M.			X	X		X	X		X	X
E. R.	X			X		X		X	X	X
L. R.			X	X			X	X	X	X
T.				X			X	X	X	

Table XIII shows the five topics chosen by each of the different individuals from the ten given topics, five of which were for imaginative, and five for expository writing. The results are chiefly interesting in their collective character. All the subjects showed a preference for the second class of topics, the number of these chosen by all the subjects being almost twice as great as the number of imaginative topics. The usual proportion in the choice of imaginative to expository topics, as shown in the table, is 2:3, the only exceptions being in the cases of *G.* and *L. R.*, whose proportion is 1:4. The imaginative topics least often chosen are those which make severest demands upon the imagination of the writer. That two of these least popular topics were selected by the three subjects who have been classed as showing less constructive imagination than the others is worthy of note. This, together with the fact that of the subjects who chose the larger proportion of expository topics, one has always been classed with the constructive type, and the other has usually been so classed, seems to

indicate that a particular power of imagination or comparative lack of it does not necessarily imply a preference for or against the exercise of that power in a given case. Tastes and abilities are not always co-ordinate.

The modification of the last two tests given to members of the Junior class show likewise a strong preference for expository subjects over imaginative: two subjects only chose the latter. The outlines for essays which accompanied the topics chosen were not sufficiently diverse in character to form a basis for classifying the individuals.

#### IV. Attention.

##### 1. Degree of Attention. (a) Cancellation of vowels.

TABLE XIV.

	Pages with Spacing.			Pages without Spacing.		
	Percentage of Error.	Time (sec.).	Percentage of Error reduced to mean time.	Percentage of Error.	Time (sec.).	Percentage of Error reduced to mean time.
B.	8.7	189	3. 8.6	6.2	212	5. 5.5
G.	9.0	214	4. 9.9	3.4	272	4. 4.0
V. M.	3.9	196	2. 4.0	1.2	200	1. 1.0
W. M.	12.1	175	5. 10.1	9.3	198	7. 8.3
E. R.	11.9	198	6. 12.3	1.8	226	3. 1.9
L. R.	18.3	196	7. 18.8	8.2	214	6. 7.9
T.	3.6	164	1. 3.0	2.0	209	2. 1.8

Table XIV shows that, in the case of every subject, the time necessary to cancel a's from pages without spacing exceeds that for pages with spacing, but that the percentage of error in the former is less than in the latter. That is to say, the demands upon the attention were greater in the pages where absence of spacing, punctuation, and capitalization necessitated the perception of each letter as a unit. The separate direction of the attention upon every letter required more time than the perception of the letters grouped into words, with the added process corresponding to the question, "Does this word contain an a?"; but it also insured greater accuracy. The associative process indicated by the question might easily be crowded out by the more interesting associations called up by the meaning of the words and sentences. Distraction, then, operated in the case of proof pages to increase the percentage of error, while in the pages without spacing the increased difficulty of perception caused an increase in the time necessary to perform the task.

The reductions in the third and sixth columns of the Table were made in order to get a relative estimate of the individual which should take account of both quickness and accuracy. The assumption made is that in a given individual, maintaining a constant degree of attention while doing a piece of work, the percentage of error is inversely proportional to the time taken for the work. Under this assumption the percentage of error of each subject was reduced to a common time, the mean of the time for all subjects, and thus all individual differences were reduced to terms of error. The order of individuals in regard to this error is different in the different kinds of pages. *E. R.* rises from the sixth to the third place when the distraction due to the sense is removed: *B.* and *W. M.*, however, are comparatively lower in rank in the second class of pages than in the first. Other divergences of order are more slight.

In the first half of the Table, we find, apparently, three groups: *T.* and *V. M.*,—*B.*, *G.*, *W. M.* and *E. R.*,—*L. R.*; in the second half, also three groups: *T.*, *V. M.* and *E. R.*,—*B.* and *G.*,—*L. R.* and *W. M.*

(b) Comparison of ease (estimated by rapidity) in reading a page of concrete description (without spacing, etc.,) and a similar page of exposition of abstract thought.

TABLE XV.

	B.	G.	V. M.	W. M.	E. R.	L. R.	T.
Time of reading concrete page.	5. m. s. 4.38	6. m. s. 7.12	2. m. s. 3.10	4. m. s. 3.40	7. m. 15	3. m. s. 3.10	1. m. s. 2.23
Time of reading abstract page.	5. m. s. 3.36	6. m. s. 4.12	2. m. s. 2.48	3. m. s. 2.40	7. m. s. 6.45	4. m. s. 3.5	1. m. s. 2.5

Table XV shows that in the case of every individual the time for reading the abstract page was less than that required for the concrete page. There are several reasons why this should be the case. The practice gained by reading the concrete page was of assistance in reading the abstract page which came after. The abstract page had somewhat fewer words (340) than the concrete page (376), and also longer words, which are easier to distinguish than sequences of short words. Moreover, a considerable number of the longer words in the abstract page occurred several times, *e.g.*, such words as 'philosophy,' 'thought,' 'absolute,' 'consciousness,' etc. It cannot, therefore, be said that the superior rapidity of reading the abstract pages is altogether caused by a higher degree of attention resulting from the greater interest excited by the nature of the thought. The order of the subjects in regard to rapidity of reading is almost the same in the two pages; the only change in order being in the cases of *W. M.* and *L. R.*, whose rank alters from fourth and third to third and fourth respectively,—indicating that *W. M.* found the abstract page relatively easier to read than *L. R.* The order

of individuals as seen in Table XV and in the third and sixth columns of Table XIV are hardly comparable, since in the former no estimate is made of the correctness of the reading. Moreover the results in Table XV are made out from single experiments, while those in Table XIV represent the canceling of a's from eight pages with spacing and five pages without spacing. The latter results, therefore, have greater validity.

We regret that these two tests should be so bare of results, since they promise (if more skilfully performed) to yield indications of prime importance as to the make-up of the individual consciousness. We had expected to discover individual differences of much more definite character and much greater amount. The tests evidently involve processes of a highly complex nature, and the conditions must be very carefully regulated if reliable results are to be obtained.

2. *Range of attention.* (a) Writing letters while reading a passage of ten lines.

TABLE XVI.

	Times of Readings.					Number of Letters Written.				Difference in time between 5th and 1st readings.	Proportion of the difference in time to the number of alphabet written.
	1st.	2d.	3d.	4th.	5th.	A.	A. B.	A. B. C.	Alphabet.		
B.	s. 28	s. 38	s. 42	s. 50	s. 113	47	62	78	91	s. 85	7.94
G.	22	22	22	21	28	29	34	39	40	6	.15
V. M.	29	30	30	30	50	40	56	57	46	21	5.45
W. M.	26	27	27	27	29	27	28	36	13	3	4.23
E. R.	27	27	29	27	31	31	40	48	20	4	3.20
L. R.	22	25	26	25	37	41	44	51	26	15	6.57
T.	27	29	30	31	29	36	40	45	25	2	1.08

Table XVI is largely self-explanatory. The time of reading, in general, increases with the complication of the accompanying acts. The amount of this increase varies greatly in different individuals. The number of a, b's is greater than the number of a's, but not twice as great; and the number of a, b, c's is greater than the number of a, b's, but not three times as great as the number of a's. That is to say, it is more difficult to write ab repeatedly while reading than to write a simply, but the sequence between these two letters, a and b, is so easy and natural that it is not twice as difficult to write the two letters as to write the one; a subject, therefore, always sets down in the aggregate more letters

when required to repeat a, b than when writing a's. The case is similar with a, b, c. The conditions are different, however, in regard to the alphabet. There the number of characters and the sequences are so greatly increased that the total number of letters written is, in several cases, less than the number of a's; and even where the number of letters is not less, the time taken for the reading and writing is increased. The extreme complication of the acts accompanying the reading, in the case of writing the alphabet, tends to distract the attention from the reading, thus lengthening the time of reading, and to cause a decrease in the total number of letters written during the reading. Sometimes one effect predominates over the other: in *B.*, *e. g.*, it is the lengthening of the time, in *T.* the decrease in the number of letters. The last column but one of Table XVI gives the amount of increase of the time for the fifth reading over that for the first (or normal) reading. The last column, giving the proportion of this difference of time to the number of letters of the alphabet written, indicates the degree of simultaneity (if this expression be permitted) of the two acts. The smaller the increase in time and the greater the number of letters written the smaller is the proportion, and the more nearly simultaneous is the performance of the two acts. The order of the individuals in regard to range of attention as thus indicated in the last column of Table XVI does not correspond to any previous grouping of the subjects.

#### V. Observation: Discrimination.

1. *Descriptions of Pictures.* Of the two pictures used in these tests, "The Golden Wedding" and "The Interrupted Duel," the former, to a greater degree than the latter, gave results which varied from one individual to another. The first picture possessed far more detail, the composition was less simple, and the interpretation was somewhat less obvious. The descriptions of the "Golden Wedding" show that the observation of the subject may be primarily directed to the particular objects or details of the picture, or to the general arrangement of the objects, that is, the composition of the picture, or to the meaning of the picture, the story which it conveys, the details observed being such as lead up to this interpretation, or explain and apply the interpretation which is given first. The different ways in which the same picture appeals to the various individuals indicate differences in mental constitution. The appeal may be primarily to the intellectual activities of perception, or, through perception, to the imagination and feelings. The descriptions written by *V. M.*, *L. R.*, and *T.* give prominence to the interpretation of the picture, but differ in use of details. In the case of *V. M.*, the details are fairly numerous, concrete in their nature, and seem to be carefully chosen with a view to substantiating the interpretation; in that of *L. R.*, the details which are abundant and minute are given first, and then followed by an interpretation of the whole. In *T.*'s description the



details are less specific in character. The account of the picture given by *G.* contains a general interpretation, a mention of two or three prominent figures, and a general arrangement of the groups of people. The descriptions of *E. R.*, *W. M.*, and *B.* are characterized by entire absence of interpretation; but these subjects also vary in the use of detail. *E. R.* had no recollection of the composition of the picture at all, and mentioned, therefore, only a few objects in the form of an enumeration. *B.*'s description contains mention of a large number of persons and objects, but fails to give any clear idea of the composition of the whole; while that of *W. M.* contains less detail, but conveys a somewhat more complete idea of the total scene. The whole number of different objects (including persons, furniture, utensils, etc.,) mentioned is 20: the number of these specifically referred to in one description varied according to the individual, from 6 to 13. *W. M.*, *E. R.*, and *T.* mentioned 6; *G.*, 1; *V. M.*, 8; *B.*, 11; and *L. R.*, 13. There was a considerable variety, therefore, in the objects selected for mention by the different subjects.—In the "Interrupted Duel" the total number of different objects mentioned was 15, and the proportion of these objects named in the different descriptions was much larger than in the case of the other picture. 8 and 12 were the limits of variation. *G.*, *W. M.*, and *T.* named 12; *B.*, 11; *V. M.*, 10; and *L. R.*, 8; *E. R.* failed to recall the picture at all. Since the scope for selection of objects was in this picture more limited, the descriptions of the different individuals were more similar in character. This similarity was further enhanced by the fact that the picture so plainly revealed the subject it was intended to represent, the result being that an interpretation of the picture was given by all (*E. R.* excepted), though that of *L. R.* was erroneous, owing to her failure to observe the minor group in the picture. The individual differences observable in the descriptions of the "Golden Wedding" tend to become neutralized in the "Interrupted Duel" by the greater use of interpretation on the part of *B.* and *W. M.*, and a somewhat less use of it by *L. R.*, *T.* and *G.* In *V. M.*, however, the tendency to interpret is, if anything, emphasized, and her description takes the form of a narrative, explaining the situation portrayed in the picture. For the reasons assigned above, the "Golden Wedding" is the picture better suited for a test of this kind. The results from it, therefore, may be accepted as revealing more characteristic differences in the individuals. These results are, as a matter of fact, in substantial agreement with those obtained in the tests for imagination.

2. *Observation of Colors.* In this test, it will be remembered, the subject was not given full information before the beginning of the experiment. It was only after he had looked at the card for the stated time (five seconds), that he was requested to name all the prominent colors on the card, with their respective situations. As the experiment could not be repeated under precisely the same conditions,

the test was given but once, and the results, therefore, may not be such as would be precisely confirmed by further testing.

TABLE XVII.

	Percentages correctly given.		Percentages incorrectly given.		Mean of (correct percentages—errors).
	Colors.	Situations.	Colors.	Situations.	
B.	50	25	0	12.5	6. 31.25
G.	75	62.5	0	0	1. 68.70
V. M.	37	37	0	0	5. 37.00
W. M.	62.5	12.5	0	0	4. 37.50
E. R.	25	0	12.5	0	7. 6.25
L. R.	62.5	62.5	0	0	2. 62.50
T.	50	50.0	0	0	3. 50.00

The results are interesting as showing that the subjects who are the best visualizers observed the colors and the place they occupied in the picture less well than did others whose mental images are predominantly in some other sense department. *E. R.*, however, who proved to have the fewest and faintest visual images, seemed here, as in the previous experiment with pictures, to have the least power of reproducing visual impressions. Since the same subject showed relatively much greater facility in the reproduction of letters and figures under the method of procedure with knowledge, it is probable that in the case of the pictures attention was not sufficiently aroused to enable the subject to form verbal associations with the visual impressions. If these associations had been formed, especially with the colors, which were so few, they could hardly fail to be recalled so soon after their formation. It is to be further observed that the order indicated in the last column of Table XVII does not agree with the order in regard to particular objects mentioned in connection with either of the pictures of the previous tests. The general grouping of subjects, however, is somewhat similar in the two cases, if descriptions of pictures are considered in respect to their total merit; the chief differences being that *G.* and *W. M.* have in Table XVII advanced from their former positions. This fact may be of significance, when it is remembered that these two subjects excelled in the memory of unconnected visual impressions (letters and words).

### 3. Discrimination of Synonyms.

The discriminations were marked in regard to quality according to the scale of A, B and C, as described under the test of Development

of Sentences,—quality in this case, however, signifying the degree of clearness and completeness of a discrimination. C, here as before, signifies the highest quality. The results of the averages of the numerical values given to the discriminations of the different subjects make it appear, as seen in the Table, that the value of *B.*'s discrimina-

TABLE. XVIII.

	Average quality of discrimina- tions.	Average length of discrimina- tions (words).	Total number of derivations.	Total number of examples.
B.	5. 89	7. 25	0	3. 14
G.	2. 106	6. 30	0	2
V. M.	4. 97	2. 54	5	2. 17
W. M.	6. 76	4. 44	0	2
E. R.	7. 77	5. 36	0	2
L. R.	3. 103	1. 65	0	1. 44
T.	1. 119	3. 49	0	4. 5

tions average about midway between B— and B, that of *G.*'s between B and B+, and so on. The remaining columns of the Table are self-explanatory. The limits of variation in quality for the different subjects the Table shows to be very narrow. The lowest quality (76) is almost B—, and the highest (119) is just less than B+. The tendency of the past training of all the subjects was towards cultivation of the powers of intellectual discrimination. There is no strongly marked parallel between clearness and completeness of the discrimination, and number of words used in its expression. *G.*'s discriminations are notable for clearness combined with conciseness of statement; for the rest, there seems to be a slight balance of clearness in favor of the longer discriminations. The tendency to illustrate the thought by means of concrete examples is shown most strongly in *L. R.*, *V. M.*, and *B.* Of these the two former have exhibited the same tendency toward the concrete in the development of themes. On the whole, this test, like that of the development of the topics for exposition, is of somewhat too general a character to bring out individual differences in regard to those activities in which the subjects most resemble each other by reason of their previous training and of the tendencies which lead to the choice of this training.

The discriminations of synonyms by members of the Junior class were more uneven in quality; but the presence of a considerable number of excellent discriminations tended to bring the mean value for the Junior students very nearly to that of the more advanced students.

VI. *Tastes.* (*Æsthetic Tests.*)

The Art, Music and Literary tests, which may be roughly classed as *Æsthetic* tests, gave the results noted in Table XIX.

TABLE XIX.

	ART TESTS.			MUSIC TESTS.		LITERARY TESTS.		
	Percentages of correct answers from given pictures.	Number named in five minutes.		Number of Musical Composers named in five minutes.	Percentages of correct answers for compositions by given Composers.	Percentages of correct answers.		
		Famous Artists.	Famous pieces of Plastic Art.			Authors of prose selections.	Authors of given poetic selections.	Sources of given poetic selections.
B.	54	21	18	16	90	62.5	62.5	25
G.	51	18	7	8	50	37.5	50.0	50
V. M.	43	15	12	11	40	87.5	62.5	50
W. M.	8	7	9	3	30	62.5	25.0	0
E. R.	10	2	7	9	20	50.0	62.5	50
L. R.	55	12	9	9	50	62.5	50.0	25
T.	63	37	14	25	100	75.0	87.5	75

The comparative results for the different subjects are more clearly shown in Table XX, in which the subjects are classified into the groups into which the numerical results in Table XIX seem to make them naturally to fall. The second part of Table XX summarizes for each subject the positions, according to groups, occupied throughout the tests, and gives also the final order of the subjects considering the *æsthetic* tests as a whole.

If it is assumed, as has been done in these tests, that a subject's knowledge of the best works and workers in the fine arts is some criterion of his appreciation of these arts, and if it is further assumed with Professor Külpe that "the *æsthetic* feeling originates in a *relation of the perceived impression to the reproduction which it excites*," i. e., that an impression which has a considerable, but not intense, degree of effectiveness for reproduction produces pleasure, it is interesting to note the final order of subjects, as seen in Table XX, in comparison with the order of subjects in regard to the average number of objects called up by association with given blots of ink. The similarity of order in this test and in that of blots is sufficient to call for remark. *V. M.* (2), *G.* (5), *E. R.* (6) and *W. M.* (7) remain the same in both; but while the order of *B.*, *L. R.*, and *T.* was (1), (3) and (4) respectively for blots, it became (3), (4) and (1) in the later test. The reason for this difference in order is not clear.

The questions in regard to favorite reading, preference for theater

TABLE XX.

	First Group.	Second Group.	Third Group.	Fourth Group.	Subjects and final order.	First Group.	Second Group.	Third Group.	Fourth Group.
						times.	times.	times.	
Art Tests.	I. T., L. R., B., G., V. M.	E. R., W. M.			3. B.	4	3	1	
	II. T.	B., G., V. M., L. R.	W. M., E. R.		5. G.	1	4	3	
	III. B., T., V. M.	L. R., W. M.	G., E. R.		2. V. M.	4	4		
Music Tests.	I. T., B., V. M.	L. R., E. R., G.	W. M.		7. W. M.		3	3	2
	II. T., B.	G., L. R., V. M.	W. M., E. R.		6. E. R.		4	4	
					4. L. R.		5	2	
Literary Tests.	I. V. M., T.	B., W. M., L. R.	E. R., G.		1. T.	8			
	II. T.	B., V. M., E. R.	G., L. R.	W. M.	T.				
	III. T.	G., V. M., E. R.	B., L. R.	W. M.					

or opera, fondness for reflective games, etc., produced answers which, in several cases, threw light upon changes in the grouping of the subjects in the three different classes of æsthetic tests. It is unnecessary to cite the answers here; it is enough to state that the questions proved to be worth asking.

The art tests with photographs and the music tests which were given to the Juniors showed, as a result, a uniformly lower percentage of correct answers in both cases. The individual differences were of slightly smaller range but were fairly constant throughout the tests.<sup>1</sup>

### § 6. Conclusion.

It is not our intention to print in this place a complete summary of the results of all experiments for the different individuals. Such a summary, has, of course, been made by us; but, in the first place, it leaves too many gaps to allow a definite differentiation of each individual from all the others, owing largely to the limited bounds within which the enquiry was purposely confined, while, secondly, we have considered it best that the reader, if he will, shall make such a summary for himself, and in this way form his estimate of the value of the tests. Our aim was principally to investigate the merit of a general method: to find the value for Individual Psychology of experimentation applied to the more complex mental activities, as well as the practicability of certain specific tests, many of which had been suggested by the advocates of such experimentation.

It will be remembered that we noted above two main problems of Individual Psychology; the first problem having reference mainly to *variations* themselves, that is, to the way in which psychical processes vary in different individuals, and according to classes of individuals; the second, to the *relations* among variations. The latter, to be sure, includes the question how individuals vary in regard to psychical processes, but it goes on further to ask how these individual variations are related to each other, when the whole range of mental processes is considered. It is this part of the problem to which attention has been directed in the present investigation, by means of the third method mentioned in the preliminary discussion, *i. e.*, the 'method of tests.'

<sup>1</sup> A remark should be made in regard to the absence of detailed discussion of results from the Junior students. The purpose in view when the tests were first given to the Juniors was to compare results from the class as a whole with the general results from the advanced students. Since, however, the exclusive use of the collective method restricted the number of tests which could be given to the Juniors, and the occasional absence of different individual members of the class caused incompleteness in the tests that were given, it was impossible to compare, step by step, the variations as seen in the advanced students with those observed in the Juniors. The comparison, therefore, could be made only in a general way. This comparison has, nevertheless, been found to be useful, and a careful working over of all the results convinces us that the idea upon which it was based was well warranted. Had the scope of the testing been somewhat more extended, results of interest and importance could, we believe, have been obtained.



The results, we believe, have shown that, while a large proportion of the tests require intrinsic modification, or a more rigid control of conditions, others have really given such information as the Individual Psychologist seeks. Thus the tests for Imagination proved to be important as forming a basis for a general classification of the individuals, according to fairly definite types; and results from other tests gave some force of confirmation to this classification, as *e. g.*, the test on Observation by description of pictures. In general, however, a lack of correspondences in the individual differences observed in the various tests was quite as noticeable as their presence. The total change in the order of subjects in the memory of single short series of words and in the recapitulation of the words of seven short series, the fact that those subjects who showed best observation of colors were not the best visualizers, are instances of this lack of correspondence, of which many others could be cited. Whether the fact indicates a relative independence of the particular mental activities under investigation, or is due simply to superficiality of testing, can hardly be decided. While, however, we do not reject the latter possibility, we incline to the belief that the former hypothesis is in a large proportion of cases the more correct.

But little result for morphological psychology can be obtained from studies of the nature of the above investigation. So many part-processes are involved in the complex activities, and the manner of their variation is so indefinite, that it is seldom possible to tell with certainty what part of the total result is due to any particular component. It is doubtful if even the most rigorous and exhaustive analysis of test-results would yield information of importance as regards the structure of mind. At all events, there is not the slightest reason to desert current laboratory methods for the 'method of tests.'

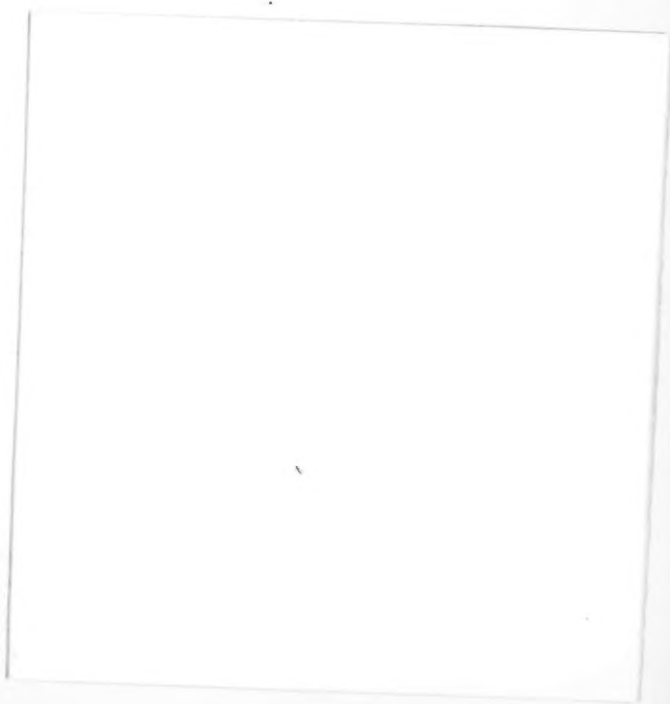
The tests employed, considered as a whole, cannot be said to yield decisive results for Individual Psychology if applied *once only to individuals of the same class*. This statement the above discussion of tests seems perfectly to warrant. *Series of such tests* are necessary in order to show constant individual characteristics. The tests, to be sure, (1) if enlarged in extent to cover a wider range of activities, might be useful for roughly classifying a large number of individuals of very different training, occupation, etc., provided that the greatest care were taken that the conditions in the case of each individual should be as favorable as possible. And, on the other hand, (2) certain groups of tests, especially selected for a particular purpose, and applied, once each in series, to a limited number of individuals, might yield valuable information on points which particular circumstances rendered

of practical importance. As engineers, pilots, and others who have to act upon information from colored signals, are roughly tested for color blindness, so other classes might often profitably be submitted to a psychological testing of those higher activities which are especially involved in their respective lines of duty.

All this, however, is largely beside the point; much preliminary work must be done before such special investigations can be of any great worth. This appears plainly from the present investigation where the positive results have been wholly incommensurate with the labor required for the devising of tests and evaluation of results. In the present state of the science of Individual Psychology, there can be little doubt that the method of procedure employed by M. Binet is the one most productive of fruitful results: that, namely, of selecting tests, and applying them to a number of individuals and classes of individuals with a view of discovering the chief individual differences in the mental activities to which appeal is made. To this should be added, however, an exhaustive study of the results from series of similar tests given to a small number of individuals at different times and in varying circumstances, in order to discover how constant the differences are, and how much of the variation may be due to changes in mental and physical condition, environment, etc. When this procedure has been followed for tests that cover all the principal psychical activities, then the investigation of limited groups of individuals for the purpose of characterizing them in respect to their mental differences may be undertaken with hope of easy and accurate results. The previous study will have made clear the many conditions involved, and the best way of modifying the 'test method' to suit varying circumstances.

In fine, we concur with Mm. Binet and Henri in believing that individual psychical differences should be sought for in the complex rather than in the elementary processes of mind, and that the test method is the most workable one that has yet been proposed for investigating these processes. The theory of the German psychologists, who hold that the simplest mental processes are those to which the investigator should look for a clue to all the psychical differences existing among individuals, we believe would be productive of small or, at any rate, of comparatively unimportant results. Whether the anthropometrical tests so largely used by American workers in this field of psychology will lead to any such correlation of these traits with those of a purely psychical character as has been suggested by some pursuing the inquiry, is a question which must be left for the future to decide. No adequate data are as yet at hand, and (as has been stated above) the American

workers have formulated no explicit theory of Individual Psychology. The method here outlined should (and may), however, be rendered more exact by modifications in accordance with the procedure of the German investigators of Individual Psychology. A combination of the principal characteristics of the two methods is, then, it seems to us, best calculated for the attainment of satisfactory results.



## PAIN AND STRENGTH MEASUREMENTS OF 1,507 SCHOOL CHILDREN IN SAGINAW, MICHIGAN.

By ADA CARMAN, Washington, D. C.

These measurements of least sensibility to pain, together with those of greatest strength, were made on 1,507 public school children in Saginaw, Michigan, through the permission and courtesy of Mr. A. S. Whitney, school Superintendent.

The instruments used in these experiments were a temple algometer and a hand dynamometer.

The temple algometer was designed by Arthur MacDonald, specialist in the U. S. Bureau of Education, and consists of a brass cylinder, with a steel rod running through one of the ends of the cylinder. This rod is attached to a spring and the cylinder is provided with scale and marker. The scale is graduated from 0 to 4,000 grammes. A brass disk 15 millimeters in diameter, at the end of the rod, is covered with flannel, so as to exclude the feeling of the metal when pressed against the skin.<sup>1</sup>

The disk is pressed against the temporal muscle, and as soon as the subject reports the pressure to be in the least disagreeable the amount is read from the scale. The purpose is to approximate as near as possible to the threshold of pain.

The Collin dynamometer was used.

Before the experiments were made the pupil answered the following questions in writing:

Name,  
Age,  
Sex,  
Order of birth, 1st, 2d, or later born,  
Color of hair,  
Color of eyes,  
Right or left handed,  
Nationality of father and mother,  
Education of father and mother,  
Occupation of father and mother,

When the pupil could not answer any of the questions he was helped by his teacher or by the experimenter. At least twenty-five per cent. did not know the color of their hair, and at least fifty per cent. did not know the color of their eyes.

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<sup>1</sup> Described and illustrated in the *Psychological Review*, July, 1898.

Most of the children were of foreign parentage of the laboring classes, by which is meant artisans and unskilled laborers.

The tables give in grammes the least sensibility to pain by pressure on the temporal muscle, and in kilogrammes the greatest strength by grasp of hand.

TABLE I.

*Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	96	2253	2191	16	14
11	104	2359	2337	19	15
12	123	2359	2337	21	18
13	152	2447	2432	22	20
14	101	2629	2523	26	23
15	79	2738	2656	30	27
16	53	2824	2700	35	30
17	33	3036	3023	40	35
18	15	3267	3077	42	38
10-18	756	2493	2466	24	21

TABLE II.

*Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	86	1874	1827	11	10
11	102	2107	1983	13	12
12	132	1873	1788	15	14
13	107	2017	1997	18	16
14	84	1955	1961	20	17
15	82	2218	2165	21	18
16	66	2433	2283	21	18
17	48	2360	2330	23	22
18	25	2478	2374	24	22
19	19	2937	2705	23	20
10-19	751	2097	2030	17	16

TABLE III.

*First born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	20	2180	2178	15	12
11	40	2420	2363	18	16
12	31	2421	2390	21	18
13	55	2537	2461	22	20
14	25	2390	2208	27	23
15	23	2354	2189	29	26
16	20	2845	2603	38	33
17	8	3288	3163	43	37
18	4	3575	3275	40	37
10-18	226	2506	2405	24	21

TABLE IV.

*First born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	29	2167	2193	11	10
11	21	2136	2133	13	12
12	36	1956	1815	15	14
13	29	2174	2140	18	16
14	24	1973	1985	20	16
15	23	2203	1963	22	19
16	24	2369	2169	20	17
17	18	2344	2386	23	21
18	7	2236	2086	20	20
19	4	2825	3125	22	19
10-19	215	2163	2096	17	16

TABLE V.

*Second born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	28	2102	2009	16	14
11	15	2520	2570	18	16
12	28	2218	2115	21	19
13	31	2442	2490	23	21
14	28	2702	2613	25	23
15	15	3000	2847	31	27
16	15	2723	2708	31	28
17	8	3050	3500	38	35
18	4	3213	3113	40	33
10-18	172	2519	2489	24	21

TABLE VI.  
*Second born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	28	1746	1714	11	10
11	35	2120	1929	13	11
13	32	1652	1633	15	13
13	24	1948	2023	17	15
14	18	2194	2142	20	17
15	19	2258	2289	23	19
16	16	2572	2397	20	19
17	9	2183	2211	21	22
18	2	3225	3150	28	21
19	6	3100	2717	21	21
10-19	189	2069	2008	17	15

TABLE VII.  
*Later born—Boys.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	48	2372	2302	16	14
11	49	2260	2245	18	15
12	64	2374	2409	20	17
13	66	2375	2381	23	20
14	48	2711	2635	26	23
15	41	2857	2849	30	25
16	18	2881	2803	33	29
17	17	2912	2732	39	35
18	7	3121	2943	45	42
10-18	358	2527	2493	24	21

TABLE VIII.  
*Later born—Girls.*

Nearest Ages.	No. of Persons.	Right Temple. Averages.	Left Temple. Averages.	Right Hand. Averages.	Left Hand. Averages.
10	29	1703	1534	11	11
11	46	2004	1957	13	12
12	64	1938	1843	15	13
13	54	1964	1908	18	16
14	42	1843	1869	19	17
15	40	2208	2221	20	17
16	26	2406	2317	21	19
17	21	2498	2333	24	23
18	16	2491	2403	25	24
19	9	2878	2511	24	21
10-19	347	2080	1998	18	16



Taking the tables of boys we find (Table I) that the sensibility to pain decreases as age increases, except at the age of twelve. The strength of grasp shows a regular increase. The left temple is more sensitive than the right temple.

Sensitiveness to pain decreases in order of birth (Tables III—VIII), first born boys being more sensitive than second born, and second born more sensitive than those of later birth. The strength of grasp is the same.

Divided into light and dark, based on color of eyes and hair, the boys with light eyes and hair are less sensitive and less strong than those with dark eyes and hair.

	Ages.	No. of Persons.	Average Sensibility.		Average Strength of Grasp.	
			Right Temple.	Left Temple.	Right Hand.	Left Hand.
Dark,	10-18	356	2462	2408	25	22
Light,	10-18	400	2570	2518	23	20

Of the 756 boys, 5 per cent. were left-handed, with an average of

Right Temple,	Left Temple.	Right Hand.	Left Hand.
2439	2359	21	19

Boys reported by their teachers as bright were more sensitive than those reported as dull, and while stronger in the right hand, were weaker in the left hand than the dull.

	Average Sensibility.		Average Strength of Grasp.	
	Right Temple.	Left Temple.	Right Hand.	Left Hand.
Bright,	2158	2152	21	17
Dull,	2256	2217	20	18

Those reported as being especially dull in mathematics were more sensitive on the right temple than on the left temple, with an average sensibility of 2,015 on the right temple and 2,281 on the left temple. Strength of grasp, right hand 21, left hand 18.

All averages as to brightness and dullness are based on ages 10-14 inclusive, number of pupils 576.

With the girls (Table II) the decrease of sensibility to pain as age increases is not so regular as with the boys, though there is a general decrease. As with the boys the left temple is more sensitive than the right.

The first-born girls show less sensibility to pain than second-

born; later born less than second-born on left temple, but more on right temple (Tables IV, VI, VIII.). The strength of grasp varies.

Girls with light hair and blue or gray eyes are less sensitive to pain on left temple, and less strong than girls with dark hair and dark eyes. On right temple they are more sensitive than the dark.

	Ages.	No. of Persons.	Average Sensibility.		Average Strength of Grasp.	
			Right Temple.	Left Temple.	Right Hand.	Left Hand.
Dark,	10-19	402	2113	1840	18	16
Light,	10-19	349	2084	2022	17	15

Of the 751 girls 3.6 per cent. were left-handed, with an average of

Right Temple.	Left Temple.	Right Hand.	Left Hand.
1922	1952	21	19

Girls reported as bright were more sensitive and stronger than those reported as dull.

	Average Sensibility.		Average Strength of Grasp.	
	Right Temple.	Left Temple.	Right Hand.	Left Hand.
Bright,	1737	1736	16	13
Dull,	2094	1868	13	12

Those reported as being especially dull in mathematics were more sensitive on the right temple than on the left, with an average sensibility of 1,688 on the right and 1,763 on the left. Strength of grasp, right hand 14, left hand 13.

Averages as to brightness and dullness are based on ages 10-14 inclusive, number of pupils being 571.

As a summary we give the following:

With both boys and girls sensitiveness to pain decreases as age increases.

The left temple is more sensitive than the right temple.

Girls are more sensitive and weaker at all ages than boys.

In general, sensitiveness to pain decreases in order of birth, the exception being that later born girls are slightly more sensitive on the right temple than are the second born. Were the number of second born girls larger this exception might not occur. Strength of grasp remains the same with boys, while it varies with girls.

Boys with light hair and eyes are less sensitive and less strong than boys with dark hair and eyes. Girls with light hair and eyes are less sensitive on the left temple, but more sensitive on the right temple than girls with dark hair and eyes. They are also less strong.

Bright boys and girls are more sensitive to pain than dull boys, and in general are stronger.

Boys and girls especially dull in mathematics are more sensitive on the right temple than on the left temple.

## SUGGESTIONS TOWARD A LABORATORY COURSE IN COMPARATIVE PSYCHOLOGY.

By LINUS W. KLINE, Ph. D.

"In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale."—*C. Lloyd Morgan*.

"But why should we bind ourselves by a hard and fast rule. . . ? Is it not the truth at which we wish to get? For myself, I am becoming more and more skeptical as to the validity of simple explanations for the manifestation of animal life whether physical or psychical."—*Wesley Mills*.

The following experiments in comparative psychology were devised to fill a small part of the work offered at Clark University in the Psychological Practicum.<sup>1</sup>

I have been guided by two principles in selecting animals for experimentation: (1) general distribution of the species; (2) an animal little influenced by captivity and permitting a variety of experiments of a psychological value.

The animals thus selected are regarded as typical, *e. g.*, earth worms of vermes, slugs of mollusca. A careful study of the instincts, dominant traits and habits of an animal as expressed in its free life—in brief its natural history should precede as far as possible any experimental study. Procedure in the latter case, *i. e.*, by the experimental method, must of necessity be largely controlled by the knowledge gained through the former, *i. e.*, by the natural method. In setting any task for an animal to learn and perform, two questions should be asked: (1) Does it appeal to some strong instinct? (2) Is it adapted to the animal's range of customary activities?

The adage, "Make haste slowly," is highly applicable to the present field of scientific work, not only in working with the animals, the manual execution, but especially in the matter of drawing inferences and interpreting the facts.

The work as a whole, on account of its newness, must be regarded as tentative. And notwithstanding the fact that the problems and experiments here outlined have been largely

<sup>1</sup>Experiments on Arthropoda (daphnia, crayfish, bees, ants, and wasps), Amphibia (frog, newt), Reptilia (lizard, turtle), and Canidae (dog) are omitted from this paper for the reason that many of them are yet untested or are in the process of making.

selected from the works of the foremost scientists in their respective fields, and further that I have retested their "workableness" in many cases from the standpoint of psychology, they still belong to the suggestive stage and must remain such until they are extensively tested—not merely discussed—by student and teacher in a number of laboratories.

The literature given here, although by no means exhaustive, contains in every case matter pertinent to the subject. The aim is to acquaint the learner with a few of the best works in the field, leaving the minor ones to his own industry.

The hope that the present outline will awaken a wider interest and enlist a larger co-operation in testing the value of the methods here set forth is my only justification for presenting this paper.

The nature of this work has necessarily put me under obligations to many persons.

For the greater part of the material itself I am indebted to those from whose works I have drawn and to whom I make acknowledgments in the references accompanying the experiments. For the original plan of the work, and for seeing that ample laboratory material was provided me, together with much assistance in the arrangement of the subject matter of this paper, I make grateful acknowledgments to Dr. Edmund C. Sanford.

I am thankful to President Hall for the loan of books from his library, and for the inspiration received from his hearty approval of the work itself.

To Dr. C. B. Davenport, of Harvard University, I feel greatly indebted, not only for the several experiments selected from his published works, and citations to literature, but also for personal suggestions and his keen interest in the purposes of the work.

#### AMOEBA.

The chief psychological interest in Amoeba is the variety of activities that it is able to perform with an apparently undifferentiated structure. It feeds, it gets rid of waste material, it reacts to stimuli, it moves from place to place, and it reproduces by division.

The student should observe carefully to what stimuli it appears responsive, and especially any cases of apparent selective activity in the taking of food, and in the latter case should consider whether or not the act in question requires a psychical explanation.

Probably<sup>1</sup> the simplest and surest method of securing Amoeba

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<sup>1</sup> Behla, Robert: Die Amöben, insbesondere von Parasitären und culturellen Standpunkt. Berlin, 1898.

This excellent little monograph, besides containing a bibliography

is from green grasses taken from streams and ponds. Put a small handful of such green material in a large evaporating dish, and barely cover it with tap water. Amoeba may be found at once. I get better results by waiting three or four weeks, replacing in the meantime the evaporated water.

Such material answers every purpose for observing the life processes of the Amoeba. By permitting the glass slide to dry up by evaporation Amoeba's reaction to desiccation may be observed.

It is convenient<sup>1</sup> to rest the four corners of the cover slip on small bits of glass of uniform thickness cemented together, or better still on four wax feet which admit, by pressure, of regulating the space between cover slip and slide—say  $1\frac{1}{2}$  mm. apart.

#### VORTICELLA.

The qualities of this infusoria that lead to its selection for study here are: first the easy observation of the same individual for a considerable period of time, due to its permanent attachment; second, the variety and clear cut character of its activities and the fact that they are performed in a comparatively short cycle; and third, the fundamental and suggestive character of these activities, viz.: contraction of stalk, movements of cilia, food-taking, reproduction, etc.

Place in a medium size glass jar a bunch of grass blades gathered from a running stream, or pond; cover with water. Vorticella may be found in abundance on the decaying grass within a week or ten days. They will "hold their own" in the

and descriptive account of Amoeba in the interests of medicine, treats historically of the many attempts to obtain a pure culture of Amoeba. No one method is as yet satisfactory. Dr. Behla, himself, recommends the following: 25 grs. of flaxseed stalks, placed in a liter of water 48 hours. Filter, and to the filtrate add a 1% solution of agar and sodium carbonate until the solution becomes alkaline. *Amoeba Spinosa* develops in large quantities. Ogata, according to Behla, put into a large evaporating dish, partly filled with water, green grass taken from an open canal. It proved to contain Amoeba and Infusoria. He put a few drops of this water into a test tube, which was filled with the following nourishing solution kept in a sterilized vessel: a filtered solution of 50cc of tap water containing 2.5% grape sugar. To separate the infusoria from the bacteria he dipped into the test tube capillary tubes 10-20 cm. long and 0.4-0.6 mm. in diameter filling them with the culture medium. Sealed the ends in a flame. The entire length of the tube was examined under a microscope and the region exceptionally plentiful in Amoeba, and freed from other forms, was marked and broken off.

<sup>1</sup>Those who may desire to study Amoeba's reactions to a single stimulus, e. g., light, temperature or chemical, should consult Verworm's *Psycho-Physiologische Protisten-Studien*, Jena, 1889; J. Loeb's *Der Heliotropismus der Thiere*, pp. 118, Würzburg, 1890; and Davenport's *Experimental Morphology*, Vol. I, pp. 155-218.

aquarium for several weeks, after which they succumb to other forms.

Their form<sup>1</sup> and structure<sup>2</sup> are described in manuals of zoölogy.

Select one in a quiescent state, and by using magnification from 375 to 425 diameters, draw the following structures: calyx (the bell shaped body), the peristomal lip or lid to the calyx; the stalk, and ribbon like contractile tissue (draw these contracted and extended), the contractile vesicle and band like nucleus.

*Activities.* I. Vegetative. Do you discover any rhythm in the contraction of the vesicle? Does the stalk contract when the calyx and cilia<sup>3</sup> come in contact with any rigid, resisting, unmanageable object, or is it indifferent to some, while it avoids others;—*i. e.*, does it seem to distinguish between harmful and harmless objects?

Put *Vorticella* in a continuous current of distilled water brought from a reservoir by means of a glass syphon, drawn to a capillary point, placed at one side of the cover-slip and a filter-paper drip applied to the other side. Is there any uniformity in *Vorticella*'s reactions to the current?<sup>4</sup> Put yeast<sup>5</sup> grains into the reservoir—note behavior toward them—try very fine pulverized chalk, salts of barium, pepsin. Do you find any uniformity in *Vorticella*'s reaction toward these substances. Are the cilia selective in the matter of food getting,<sup>6</sup> or do they admit all sorts of material indifferently at one time and reject all food material whatever, at other times, owing, perhaps, in the latter case to satisfied hunger?

II. Reproductive. Reproduction in *Vorticella* may take place by fission or by gemmation. The former process may frequently be seen, the latter less frequently.

The first signs of multiplication by fission may be seen in the calyx taking on a roundish form, the longitudinal axis shortening. Follow and note all the changes from this stage on till complete division takes place. Note preparations made by the daughter *Vorticella* previous to its leaving the mother stalk. Do you observe anything that indicates a difference in the sensitivity on different parts of the calyx?

<sup>1</sup>Kent, Saville: *Manual of Infusoria*, p. 675.

<sup>2</sup>Nicholson, H. A.: *A Manual of Zoölogy*, p. 100.

<sup>3</sup>Hodge and Aikens: *Am. Jour. of Psychology*, Vol. VI, No. 4.

<sup>4</sup>Kline, L. W.: *Am. Jour. of Psychology*, 1899, Vol. X, No. 2, p. 260.

<sup>5</sup>Commercial yeast may be used—should be dissolved in sterilized water.

<sup>6</sup>Weir, James: *The Dawn of Reason*, N. Y., 1899, p. 8.



## PARAMECIA.

This hardy, prolific, and swiftly moving infusoria readily responds to a wide range of primitive stimuli, such as gravity, light, contact, temperature and chemical substances. Observations of the responses of such a one celled organism to this varied group of stimuli must be both interesting and instructive to the psychologists.

Paramecia occur in abundance in stagnant water containing decaying vegetable matter.<sup>1</sup> Two or three weeks before they are needed, put hay or grass in a jar of water, and keep in a warm room. In such a jar they may be kept for indefinite periods in immense numbers. To prevent the paramecia on the slide from moving too rapidly, it is advisable to put them in a 2.5% solution of gelatine in water. Study first with the low power, then with the high.

The following structures should be made out: the position and shape of the buccal cavity, nucleus, contracting vacuoles, non-contracting vacuoles, cilia, and trichocysts.

*Movements of Cilia.*<sup>2</sup> Remove a large number of Paramecia from the culture medium by means of a pipette on to a glass slide. Cover the preparation with a cover glass supported by glass rollers of capillary fineness and of *uniform thickness*. Thrust under the cover slip a couple of pieces of fine capillary glass tubing.<sup>3</sup> After the Paramecia begin to collect along these glass tubes as well as the glass rollers, run carmine water under the cover glass; select a quiet individual and observe how the carmine grains pass by it. Indicate by arrows placed outside the periphery of your drawing the direction of movement of the carmine. What do you infer concerning the movement of the cilia? Do the grains whirl as much about a moving individual as about a quiet one? Can you explain?<sup>4</sup>

*Geotaxis.* The effect that gravity<sup>5</sup> has in determining the verticality of the body and thereby determining the direction

<sup>1</sup>Kent, Saville: A Manual of the Infusoria. Vol. II, pp. 483-488. Pl. 26, Figs. 28-30.

<sup>2</sup>Jennings, H. S.: Reactions of Ciliate Infusoria. Jour. Phys., 1897, Vol. XXI, p. 303.

<sup>3</sup>Ludloff in studying the motions of the cilia in electrotaxis confined the animals in a thick gelatine solution. Jennings considered their motion in such a medium as abnormal and recommends water containing carmine grains.

<sup>4</sup>Taken from Davenport's outline of requirements in zoölogy for use in preparing students for Harvard University.

<sup>5</sup>Verworn, Max: Ueber die Fähigkeit der Zelle, activ ihr spezifisches Gewicht zu verändern. Pflüger's Archiv, Vol. LIII, 1892, pp. 140-155. See also by the same author: Psycho-Physiologische Protisten-Studien, pp. 121-122.

of locomotion is termed geotaxis.<sup>1</sup> Creatures whose axial orientation and consequent locomotion are perceptibly influenced by this force are geotactic.<sup>2</sup>

(a). Fill half full with the culture medium of *Paramecia* a glass tube  $1\frac{1}{2}$  cm. in diameter and 60 cm. in length. Keep the tube vertical and in uniform temperature and light—not direct sunlight. After a few hours the organisms will be found at and near the surface of the water.

(b). Fill the remaining half of the tube with hydrant water, and, keeping it vertical as before, note the results. Twelve or fifteen hours later they may be found 3 to 6 cm. from the surface of the water (see chemotaxis). Turn the tube bottom side up and observe the time for complete migration to the upper<sup>3</sup> end.<sup>4</sup>

A rough and ready demonstration of this geotactic response may be found by filling a test tube nearly full of the culture medium. To prevent the free end becoming richer in oxygen, seal with an impermeable plug of wax or a rubber stopper. Do not expose the tube to direct sunlight. For the theoretical interpretations of the geotactic responses the student is referred to the works of Verworn, p. 141; Jensen, pp. 462-476; Davenport, pp. 122-124. (See literature given below.)

*Chemotaxis.* (a). Remove a large number of *Paramecia* from their culture medium by means of a pipette on to a glass slide. Drop into their midst a small bit of decaying vegetable or animal material. Cover the preparation with a cover glass supported by capillary glass rollers of uniform thickness. Note the behavior of *Paramecia* toward the decaying material.

(b). Introduce under the cover glass, by means of a pipette drawn to capillary fineness, rancid oils, *e. g.*, olive oil, cod-liver oil. Use also a drop of water from putrefying meat, beef ex-

<sup>1</sup>Jensen, Paul: Ueber den Geotropismus niederer Organismen. Pfüger's Archiv, 1892, Vol. LIII, pp. 428-480.

<sup>2</sup>Davenport. C. B.: Experimental Morphology Vol. I, pp. 112-125.

<sup>3</sup>Advantage may be taken of the negative geotactic activity of *Paramecia* for securing large numbers in a small quantity of water. It also serves as a means for washing out the water in which they were bred.

<sup>4</sup>Miss Platt (The Amer. Nat., Vol. XXXIII, No. 385, Jan., 1899,) and Dr. Jennings (Amer. Jour. of Phys., Vol. II, 1899,) report that *paramecia* in this country are not so markedly geotactic as those used by European investigators. During the fall and early winter of '98 I brought large numbers into small volumes of water by taking advantage of the geotactic responses which they then so readily displayed. In April, '99, I had an occasion to repeat the process. My efforts failed. The *paramecia* remained scattered throughout the length of the tubes for several days. Both spring and fall cultures were of the same species and reared in similar mediums.

tract, etc. It is best to use a fresh lot of *Paramecia* for each new substance.

(c). The following salts, acids, and alkalies were used by Dr. Jennings.<sup>1</sup>

Substance.	Wk. Sol.	Stg. Sol.	Substance.	Wk. Sol.	Stg. Sol.
Copper Sulphate	+	( <sup>2</sup> )	Sodium chloride	—	—
Sulphuric acid	+	—	Sodium carbonate	—	—
Hydrochloric acid	+	—	Sodium bicarbonate	—	—
Acetic acid	+	—	Potassium hydroxide	—	—
Nitric acid	+	—	Sodium hydroxide	—	—
Tannic acid	+	—	Potassium bromate	—	—
Mercuric chloride	+	—			

<sup>2</sup>+ = positive and — = negative chemotaxis.

Solutions of  $H_2SO_4$  of the following strengths give positive chemotactic reactions:  $\frac{1}{10000}\%$ ,  $\frac{1}{20000}\%$ ,  $\frac{1}{40000}\%$ ,  $\frac{1}{80000}\%$ ,  $\frac{1}{160000}\%$ .

(d). Repeat experiment (b) under geotaxis and note that after they have gathered at the surface they recede or fall from 3 to 6 cm. from the surface. Can you explain?

(e). Repeat (a) using a bit of filter paper or a small piece of linen fibre. After they have collected in large numbers about these objects, withdraw by means of a capillary pipette a drop of water from within the area to which the *Paramecia* are confined. Inject this drop beneath the cover glass of a second preparation in which *Paramecia* are uniformly distributed. The behavior of *Paramecia* to this new fluid should be very carefully observed. Their behavior under conditions in experiments (d) and (e) is now believed to be due to the presence of  $CO_2$  excreted in the respiratory process of the organisms. Jennings has shown that they are attracted by weak concentrations of  $CO_2$  and repelled by strong.<sup>2</sup> This fact greatly complicates and oftentimes vitiates experiments in chemotaxis with these animals.

*Thigmotaxis.* The stimulus offered by mere contact with a solid body is termed thigmotaxis. Animals that have a tendency to cling to, or to move along solid bodies are thigmotactic. Bits of sponge, linen, cotton, or cloth fibre, filter paper or bits of glass may be employed to demonstrate thigmotactic activities of *Paramecia*. These substances should be sterilized before using. The first gathering of *Paramecia* about such inert, insoluble bodies is thigmotaxis, but experiments (d) and (e)

<sup>1</sup>Jennings, H. S.: *Loc. cit.*, pp. 258-322.

<sup>2</sup>For a very satisfactory exposition of this subject, together with tests for detecting the presence of  $CO_2$ , see the paper by Dr. Jennings already referred to. The same author has given an entirely new and far more satisfactory explanation of positive chemotaxis in a more recent study of *Paramecia*. See *Am. Jour. Phys.*, Vol. II, May, 1899.

under chemotaxis suggest that a continuation of the gathering in one place is due to the presence of  $\text{CO}_2$  excreted. Dr. Jennings<sup>1</sup> concludes that "the reactions which play the chief part in the normal life of *Paramecia* are *negative geotaxis*, *positive thigmotaxis*, and *positive chemotaxis toward carbon dioxide*." This is very likely true and at first it might appear superfluous—at least for psychology—to investigate their reactions to any other kind of stimulation. Temperature, however, stands in such vital relations with life in general, necessitating through its frequent and wide variations, ever new adjustments, that it seems advisable to give a method of testing the reaction of *Paramecia* to temperature.

*Thermotaxis.* Mendelssohn<sup>2</sup> has demonstrated that *Paramecia* are negatively thermotactic to temperatures above and below  $24^\circ\text{--}28^\circ\text{C}$ , and are positively thermotactic to temperatures within and including these limits,<sup>3</sup> i. e.,  $24^\circ\text{--}28^\circ\text{C}$  is their optimum.<sup>4</sup>

An apparatus yielding results quite satisfactory for demonstrational purposes may be constructed on the following plan: (1). A wooden frame—consisting of two uprights 16 inches long and 6 inches apart joined at the top by a cross beam and firmly joined to a wooden foot about 1 foot square; (2) a glass tube 6 inches long and  $\frac{7}{8}$  inches in diameter with a  $\frac{3}{8}$  inch hole at its middle point. Close the ends of the tube with cork stoppers containing a  $\frac{3}{8}$  inch hole bored near the periphery. Insert the stoppers in the tube so that their holes will be as near the bottom of the tube as possible; (3) affix, transversely, on the inside of each upright, ten inches above the foot, a  $\frac{1}{4}$  inch lead pipe one end of which carries a coil of two turns, of diameter barely sufficient to admit the glass tube.

The glass tube may also carry near its middle portion a movable pipe of one coil. Differences of temperature may now

<sup>1</sup> Jennings, H. S.: *Loc. cit.*, p. 321.

<sup>2</sup> Mendelssohn, M.: *Archiv f. d. ges. Physiologie*, Vol. LX, pp. 1-27.

<sup>3</sup> His apparatus was simple and excellent. It consisted of a brass plate 20 cm. x 6 cm. and 4 mm. thick, supported in a horizontal plane. To its under surface was attached, transversely, tubes through which hot or cold water was run at pleasure from a reservoir elevated above the plane of the brass plate. In the middle of the plate a space 10 cm. x 2 cm. and 2 mm. was cut out and into which a glass or ebonite trough was fitted. Small thermometers with bulbs at right angles to their stems were placed in the plane of the trough and served to measure the temperature at any point. Desired differences of temperature between any two points along the trough were secured by means of water of different temperatures running through the transverse tubes.

<sup>4</sup> Thermotactic axis-orientation is a reaction to the stimulus created by the difference of temperature between the anterior and posterior ends of an organism. See discussions by Davenport and Mendelssohn.

be secured according to Mendelssohn's method (see note p. 406), or, if connection with hydrant faucets is possible, interpose between the faucets and the lead pipes two metal worms. By applying heat to one, and packing ice around the other, continuous streams of hot and cold water may be secured.

The following rough method readily shows the thermotaxis of *Paramecia*: Build a trough of wax on a glass slide  $6\frac{1}{2} \times 1\frac{1}{4}$  inches. Fill the wax trough with "Paramecia water." Place the slide on two flat glass dishes juxtaposed. In one keep hot water, in the other ice. Let the hot water and ice barely touch the under surface of the glass slide. The movements of *Paramecia* may be followed with a hand lens.

(a). By means of geotaxis secure a large number of *Paramecia* in a small quantity of water. Pour into the glass tube "Paramecia water" until it barely covers the thermometer bulbs. Too much water will start up currents which impair the results. Find what temperatures attract and what repel *Paramecia*.

(b). Supposing that *Paramecia* migrate from a temperature  $10^{\circ}\text{C}$  to a temperature  $18^{\circ}\text{C}$ , and from temperature  $32^{\circ}\text{C}$  to temperature  $26^{\circ}\text{C}$ , make the further experimentation that is necessary to find their optimum.

(c). *Acclimatization*. Mendelssohn<sup>1</sup> found that, if *Paramecia* be kept in a temperature from  $36^{\circ}$ - $38^{\circ}\text{C}$  from 4-6 hours, and then placed in a rectangular vessel whose end temperatures are  $24^{\circ}$ - $36^{\circ}\text{C}$  respectively, they will occupy a position corresponding to  $30^{\circ}$ - $32^{\circ}\text{C}$ . If, however, they are kept in a temperature  $18^{\circ}\text{C}$  and then placed in the vessel whose end temperatures are suddenly raised, they reach their optimum at  $24^{\circ}\text{C}$ .<sup>2</sup> Repeat this experiment. What inferences may be drawn from the facts of acclimatization?

#### HYDRA. (*Hydroidae*.)

These fresh water polypys belong to the primitive forms of double walled animals (coelenterata.) They (coelenterata) present to us for the first time organs and tissues composed of cells, and the *co-ordination* of different parts in the performance of certain activities, *e. g.*, simultaneous closing in of tentacles on some object of prey.

Fresh water hydra may be obtained by gathering from fresh pools Lemna, sticks, and grass and putting them into an aquarium. Hydras, which are attached to these objects, will then

<sup>1</sup> Mendelssohn, M.: *Loc. cit.*, pp. 19-20.

<sup>2</sup> Davenport, C. B.: *Loc. cit.*, 1899, pp. 27-32. See also Loew, O.: Ueber den verschiedenen Resistenz grad im Protoplasma. Archiv f. d. ges. Physiologie, 1885, Vol. XXXV, pp. 509-516.

usually migrate within a few days to the light side of the vessel. Hydras can be kept readily throughout the winter in a large glass jar containing Lemna, chara, water cress, and Entomostraca for food.<sup>1</sup>

*Touch.* Place a Hydra in a watch-glass full of water. Touch the tentacle with a needle. What movements?

*Selecting Food (Taste).* (a). Drop cautiously and at intervals of a few minutes upon the surface of the water over the tentacles of the Hydra a drop of water, of sugar solution, of acid. What differences in the movements?

(b). Bring a Daphnia (previously stranded) on the end of a needle to the tentacles of the Hydra. Note the result. With another Hydra, use a bit of plant tissue.

*Reaction to Light (Photopathy).*<sup>2</sup> Place in a small glass jar full of water containing Lemna and Entomostraca two or three large, budding Hydras. Cover the jar with a box, placing the slit next to the window. Means of aeration should be supplied the glass jar. Note at short intervals for two weeks the position and number of Hydras in the jar.<sup>3</sup>

"Place a Hydra in a watch-glass with a little water, and by means of a needle and a penknife cut it into two or three pieces. Let the pieces expand and draw them. By means of a clean pipette place the pieces in a small Stender dish, in clean water. Draw the pieces again after 24 hours, and after a longer period if necessary."

#### EARTH WORMS. (*Lumbricus Agricola.*)

Worms changed the course of animal evolution from a radial to a bilateral form and established permanently the very fundamental principle of metamerism. Those that have migrated from water to land have, by reason of their crawling habits, greatly accentuated all those differences, begun in the sea, between ventral and dorsal parts, between anterior and posterior ends. These structural and physiological differentiations have an interest for the psychologist in that they express a correlation between the degree of sensitiveness and the relative use of the parts of an organism.

<sup>1</sup> For anatomical descriptions of Hydra see Manuals of Zoölogy.

<sup>2</sup> "The wandering of organisms into a more or less intensely illuminated region, the direction of locomotion being determined by a difference in intensity of illumination of the two poles of the organism, is photopathy." Davenport: Experimental Morphology. Part I, p. 180. See also Vitus Graber: Grundlinien zur Erforschung des Helligkeits und Farbensinnes der Thiere. pp. 318, Leipzig, 1884.

<sup>3</sup> Wilson, Edmund B.: The American Naturalist, Vol. XXV, pp. 413-425, 1891. This paper of Prof. Wilson's contains also an account of Hydras reactions to colored light.

The nature<sup>1</sup> of the soil, as to its compactness, moisture, fertility, that is most favorable to the presence of earth worms; the shape and contents of their burrows; the relation of the amount of their castings to the changes of the weather—all must be studied out of doors in their natural habitat.

*Sense Organs.* Miss Langdon's<sup>2</sup> anatomical studies have demonstrated very thoroughly, "that the sense organs are distributed over the entire surface of the body, but are most numerous and largest at each end."<sup>3</sup> It has also been found that the anterior and posterior portions of the body react to weaker solutions of strychnine and saccharine than do the middle portions.

*Reactions to Chemicals.* Apply very gently to different portions of the surface a few drops of strychnine varying in strength from 1:10000 to 1:100000; also solutions of different strengths, of saccharine and creosote.

*Touch.* Their sensitiveness to touch or a jar may be seen by tapping gently a vessel containing them. Blow the breath gently against the head end,—what effect?

*Sight.* Earth worms may be kept for an indefinite time in earthen jars containing rich soil. (a). Keep the entrance of their burrows illuminated all night, compare in the morning by weight the amount of castings with those of the previous morning. (b). Compare also the amount of food eaten with that of the previous night. (c). During the day expose (taking care to avoid jarring the vessel) the top of the vessel suddenly to the light—note how quickly the worms disappear beneath the surface when the light flashes on them. (d). Cover a pane of glass with moist filter paper, place a worm upon it and set the glass near a window—record the reactions of the worm. (e). Allow direct sunlight to fall upon the head end of the worm, the tail end, the middle. Make note of the reactions.

*Food.* Give at night three pieces each of the following vegetables—celery, potato, cabbage, apple and onion—all cut wedge shaped. Arrange the pieces of each vegetable, thus cut, in the form of a star, with their bases toward a common center. Note in the morning what pieces have been most eaten and the relative position of the pieces that have been

<sup>1</sup>Darwin, Charles: *The Formation of Vegetable Mould through the Action of worms, with observations on their habits.* D. Appleton & Co., New York, 1885, pp. 326. This book should be read by every student of nature, not merely for the subject matter *per se*, but more particularly for the method and spirit that is so admirably brought to bear on a group of commonplace facts.

<sup>2</sup>Langdon, Fanny E.: *Am. Jour. of Morphology*, 1895, Vol. VI, p. 218.

<sup>3</sup>Lenhossek, Michael V.: *Ursprung, Verlauf und Endigung der sensibeln Nervenfasern bei Lumbricus.* *Arch. f. Micros. Anat.*, 1892, XXXIX, pp. 106-136.



disturbed. This should be repeated often enough to establish with certainty the presence or absence of a preference for certain foods.

*Taste.* Dip a piece of cabbage or celery into a strong solution of quinine and place it near a fresh piece of the same food, of same size and shape—notice whether the piece dipped in quinine is disturbed during the night.<sup>1</sup>

*Smell.*<sup>2</sup> (a). Bring near to the head end of the worm in succession bits of sponges or filter paper saturated with water, with sugar solution, with onion juice, with acetic acid, and with beef extract. Does the worm react? (b). Bury in a hole about the size of a hen's egg a piece of onion. Pack the earth firmly, bury a second piece near by in a similar way, but do not pack the earth.<sup>3</sup> Notice which is first disturbed.

*Boring* (a). Place three or four worms in a pot of loose earth and note the time in which they disappear. (b). Press and pack the earth and repeat the experiment. (c). Try different kinds of soils—note where the worms go down. Do they swallow the earth while boring? Methods and rate of boring may be conveniently observed in tall narrow glass jars.<sup>4</sup>

*Methods of Burying.* (a). Place without order in a jar over night fifty dead pine needles. In another jar the same number of green pine needles. Note the next morning the arrangement of dead and green needles. (b). Make the same experiment during the day time—after covering the top of the jar with a black cloth. (c). Put dead pine needles in both jars; keep one jar in a temperature of about 22°C over night, and the other out doors uncovered. Compare the number of needles drawn in.

#### SLUGS. (*Limax Maximus.*)

This species of *gastropoda* may be found<sup>5</sup> during the warmer seasons in gardens, orchards, dairy houses and the like, and during the winter seasons in greenhouses. They seek dark, shady, damp places.

<sup>1</sup> Graber, Vitus: *Loc. cit.*, pp. 290-295.

<sup>2</sup> After Darwin's, probably no other work on the senses of earth worms is more helpful and suggestive than that of Nagel's. *Bibliotheca Zoologica*, Sept. 18, 1894, pp. 146-150.

<sup>3</sup> This experiment was used by Darwin to test the worms sense of smell. The food placed in the loose earth was usually found first. Might not this be partly due to the fact that the loose earth offered easier penetration to the worm?

<sup>4</sup> For the power of worms to regenerate lost parts see T. H. Morgan's paper in *Anat. Anz.* Bd. 25. No. 21, s. 407, 1899.

<sup>5</sup> I keep them alive all winter in a wooden box partly filled with rotten wood and rich soil taken from their natural habitat. They eat vegetables, fruits and meat.

Sense Organs:<sup>1</sup> Eyes, auditory vesicles (otocysts), tactile and olfactory organs are present.

Senses. They react to odors,<sup>2</sup> sound, touch, light, heat and gravity.

*Sense of Smell.*<sup>3</sup> (a). Reactions to odors in the form of liquids may be secured by putting a band or stream of the solution on a pane of glass at right angles to the snail's line of motion. Do you find characteristic reactions toward different odors. Look for objectionable and unobjectionable odors; (b) note in seconds, in each case, the interval elapsing before the first responses.

*Sight.* (a). Do they discern objects?<sup>4</sup> Weir<sup>5</sup> is inclined to think that they do. "The snail carries its eyes in telescopic watch-towers . . . and, as semi-prominent and commanding view points are assigned to its organs of sight, one would naturally expect to find a comparatively high degree of development in them." His experimental test runs thus: At the end of a ten foot pole suspend, by means of a string, a white or black ball. The ball is made to describe a pendulum-like movement to and fro in front of the snail on a level with the tips of its horns. I suggest that a pane of glass be interposed between the snail and the swinging ball, thus preventing the possibility of creating disturbing air currents. (b). Put a specimen on a pane of glass 8 x 10, and place the glass horizontally near a window and let the slug be parallel to the window. Do not let direct sunlight fall upon it.<sup>6</sup> Plot the position of the slug at intervals of ten seconds.<sup>7</sup>

*Taste.*<sup>8</sup> Nagel<sup>9</sup> believes that the lips and mouth parts of the slug are moderately susceptible to taste stimulus. By means of a pipette, place one at a time, and at right angles to the snail's line of motion, a band of distilled water, of a weak solution of sugar, of acetic acid, of quinine, of alcohol, of cheese-water, of meat juice, etc.,—make a record of its behavior on reaching the different bands of solution.

*Locomotion.* Place the slug on the glass and study its locomotion from the under side of the plate.

<sup>1</sup> Claus and Sedgwick: Text-book of Zoölogy. 1884, Vol. II, p. 34.

<sup>2</sup> Spengel, J. W.: Die Geruchsorgane und das Nervensystem der Molluskin. Zeit. f. wiss. Zoöl., Vol. XXXIV.

<sup>3</sup> Nagel, Wilibald A.: Bibliotheca Zoölogica, heft, 18, pp. 163-168, 1894.

<sup>4</sup> Lubbock, Sir John: Senses, Instincts, and Intelligence of Animals. p. 140.

<sup>5</sup> Weir, James: *Loc. cit.*, pp. 18-20.

<sup>6</sup> Hot water or a solution of ether and alcohol will cleanse the glass of the slime which should frequently be removed.

<sup>7</sup> Loeb, J.: Der Heliotropismus der Thiere. Würzburg, 1890, pp. 93-100.

<sup>8</sup> Lubbock, Sir John: *Loc. cit.*, p. 22.

<sup>9</sup> Nagel, W. A.: *Loc. cit.*, p. 164.

*Geotactic Sense.* A rough and ready demonstrational method is to place the slug on a pane of glass, parallel to one edge of the pane, hold the pane vertical and shield from lateral lights. Represent graphically the position of the slug at the beginning of the experiment, and at intervals of ten seconds, for about a minute.

The geotactic sense of the slug has been so well demonstrated by Davenport<sup>1</sup> that I can do no better than give his methods. A dark, wooden box of cubical form about 35 cm. in diameter, a dense, opaque, black cloth to cover the open side of the box which must be directed upwards, are required; a glass plate about 30 cm.<sup>2</sup> square carries the slug and is so placed in the dark box that one edge fits into one of the lower angles of the box while the opposite edge may be elevated to any degree ranging from 0° to 90°. Measure the angles off, upon one side of the box, and bore a hole at every fifth degree, so that the glass plate may rest on plugs inserted into the holes. The angular deviation of the axis of the body during a given time from the position in which it was first placed may be measured off by means of a protractor.

If the student desire to pursue the question of geotaxis further, he may investigate to answer the following questions, which may readily be determined by experimentation. (a). "What relation exists between a variation in the pressure of gravity and the precision of orientation?" (b). "What is the limiting pressure which will call forth the geotactic response?"<sup>3</sup>

The former is demonstrated by ascertaining the angular deviation of the slug from a vertical position upon the plate at various inclinations from 0° to 90°, and after the lapse of a constant time (45 seconds). The data gained in answer to the first problem furnishes an answer to the second.

Preliminary to (a): Ascertain whether the *quickness* of the response of the slug is modified by the strength of the action of gravity, *i. e.*, does the slug respond as quickly and effect as complete an orientation at say 15° as at 75°? For this purpose, place the slug on the glass so that its long axis is parallel to the lower edge of the plate. Set the glass successively at 60°, 45°, 30°, 20° and 15°, and make five tests at each angle upon one and the same slug. Two time intervals should be taken: (1) the time elapsing before the first response to gravity occurs, and (2) the interval required for

<sup>1</sup> Davenport, C. B.: Jour. Phys., Vol. XXII, pp. 99-110, 1897-98.

<sup>2</sup> I receive satisfactory results from a box 10 x 8 x 7 inches deep.

<sup>3</sup> In addition to these questions, Dr. Davenport asks a third: What determines the position of the head end? A solution of this question involves experimentation beyond what is contemplated in this course.

the organism to place its entire axis in a vertical position. To avoid exposing the slug to the action of light during the preliminary experiment, the completeness of orientation should be observed after different periods of time, *e. g.*, at the end of 30, 40, and 50 seconds. That period in which orientation is just effected should be the time selected for future experiments.

(a). Set the plate at the following angles:  $90^{\circ}$ ,  $60^{\circ}$ ,  $45^{\circ}$ ,  $30^{\circ}$ ,  $20^{\circ}$ ,  $10^{\circ}$  and  $0^{\circ}$ . At each angle make six determinations on each one of five slugs. For each angle find the mean of the thirty determinations of the angular deviation of the slug from the vertical position, (b) note the extreme deviations from the vertical in the case of each slug.<sup>1</sup>

#### FISH.

A study of fishes in the interests of comparative psychology is exceedingly desirable, for the reason that they stand at the bottom of the great back-boned series of animal life presenting in a simple and fundamental form all the essential structures characteristic of that group. To the fish we owe a debt for having encased the nervous system in a bony vertebral column, for developing an efficient neuro-motor mechanism operating about a stiff longitudinal axis, and for having "staked out" or laid down the ground plan of the nervous system on which the forces of evolution have erected the complex structures of higher forms.

The following are some of the fish suitable for such a study; pickerel<sup>2</sup> (*Esox Americana*), perch (*Perca Americana*), goldfish (*Cyprinus Auratus*), horned pout, common bull head (*Ameiurus nebulosus*) and shiners and spotted tail minnows (*Notropis hudsonius*) and stickle-back (*Eucalia inconstans*). Both pickerel and perch should be kept in large aquaria supplied with a continuous flow of water—a forced stream is preferable. Chara, water cress, or other water grasses should be supplied and, of course, permitted to grow. Shiners, earth worms, newts, young frogs serve as food. Gold fish do not require constant running water. It should be changed, however, every week or two. Supply the aquaria with sand and pebbles, and grasses—like water cress, cabomba, chara.

Food for gold fish may be had of the dealers.

*Food.* (a) Feed regularly—daily or every other day depend-

<sup>1</sup> See also Geotaxis by Davenport, Experimental Morphology, Part I, p. 119.

<sup>2</sup> The scientific names of North American fishes can be found in U. S. Com. of Fish and Fisheries, report of 1895, pp. 209-590. This work was prepared by President David Starr Jordan and Dr. B. W. Evermann.

ing on the species and somewhat on the season. Note the time required for the different species to recognize your approach and presence.<sup>1</sup> Do some never learn to recognize you? (b). Compare the manner in which, *e. g.*, perch<sup>2</sup> and pickerel seize their food (live minnows). Can you account for the difference? (c). See if you can detect a carnivorous fish stalking its prey. (d). Cut the rice wafer preparation for gold fish into pieces about 1 cm. square. Give the fish, along with the two or three pieces of wafer, a piece of decided yellow paper cut like the wafer in size and shape. Note carefully the results. Repeat the experiment often enough to justify a conclusion. Next give them paper of a much lighter yellow and observe their behavior toward it. Is it touch or taste or both that acquaints them with the paper? Finally, give them cut pieces of white filter paper, which very closely resembles the rice wafer. At each experiment do not give more than two or three bits of rice wafer with the one piece of paper. It would be of great interest to find out if the gold fish would ever learn not to strike at the white filter paper. (e). Feed<sup>3</sup> perch on shiners for three months, then partition off a portion of their aquarium with a pane of glass. Every other day, at the feeding hour, put shiners in the new division. Note on each occasion the number of attempts made by the perch to catch the minnows. Remove the minnows from the tank at the end of each observation. Feed the perch earth worms on days not experimenting. Should the perch finally become indifferent toward the minnows, remove the glass partition. Note the effect. (f). Some fish, like pickerel, appear to have "table manners," others, like sticklebacks, snatch at times the food from each other's mouths as do the hens.

*Temperature.*<sup>4</sup> The sensitiveness<sup>5</sup> of fish to temperature varies greatly among different species. (a). If a minnow be transferred from a temperature of about 20°C to 2°-4°C, and allowed to remain ½ minute, it will soon appear as dead. If,

<sup>1</sup>McIntosh, W. C.: Note on the Memory of Fishes. *Journal of Mental Science*, Vol. XLIV, pp. 231-235, 1898.

<sup>2</sup>Neither pickerel nor perch eat dead fish.

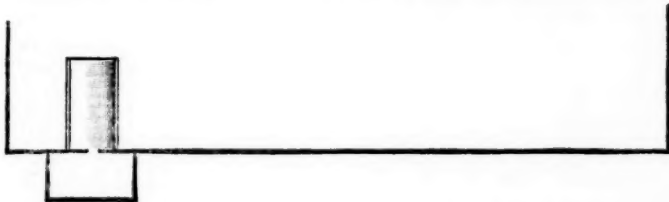
<sup>3</sup>This experiment was suggested by the famous experiment of Möbius on pike. The story runs that pike, having lived for some time in a tank separated by a glass plate from another in which small fish were living finally desisted from trying to catch them, and on the glass plate being removed made no attempt to molest the small fish. See interpretation by Prof. Bateson. *Journal of Marine Biological Association*, pp. 243, 1890.

<sup>4</sup>For an account of some experimentation and observation on the Sense-Organs and Perceptions of Fishes, see W. Bateson in *Journal of Marine Biological Association*, Vol. I, pp. 239-248.

<sup>5</sup>Goode, G. Brown: U. S. Fish Com. Report, 1877, pp. 51-72.

after a minute, it be transferred successively through 10°C, 15°C, and back to 20°C, life returns;—transferring directly from 2° to 20°C often kills the fish.

(b)<sup>1</sup> The following apparatus may be used not only for testing their sensitiveness to temperature, but also for finding their optimum. (I suggest that the test be made with shiners, using



20 or 30 at a time). A zinc trough about 20 cm. deep, 16 cm. wide and 2.4 meters long supported by a wooden frame. [See cut.] Solder to the bottom of the trough 16 cm. from one end a tin box 12 cm. wide, 15 cm. long and 6 cm. deep. The box receives water through a hole cut in the zinc trough. Solder a stand-pipe to the zinc trough about the hole leading to the tin box. Apply heat to the tin box. The water in the trough should not exceed 2½ inches in depth. The end opposite the tin box should rest on iced sawdust. Ice may be applied to the sides of the trough, and also put in the water to secure desired differences of temperature. Lay lengthwise of the trough a strip of board containing ¼ inch holes about six inches apart. Thrust thermometers through the holes and into the water two inches below its surface.

*Sight.*<sup>2</sup> Observations<sup>3</sup> made on different species readily show that there are wide differences in their range of vision, *e. g.*, perch appear to recognize the human figure about 30 feet away, minnows 20 to 25 feet away and pickerel 10 to 15 feet.

With the room darkened and with a magic lantern mounted

<sup>1</sup> An apparatus of this sort gave satisfactory results in searching for the optimum temperature of tadpoles. See *Am. Jour. of Psychology*, 1898, Vol X, No. 1, pp. 8-10.

<sup>2</sup> Bateson, W.: *Loc. cit.*, pp. 242-248.

<sup>3</sup> One may connect with observations on the sight of fishes experiments and observations on their color changes. The horned pout is said to alter its color when transferred from a white to a dark dish. Abbott and others cite cases of color changes during emotional excitement. The different hues on my perch are more pronounced after an exciting chase for a minnow. It appears that changes in the intensity of light causes apparent changes in color.

on a rotating table placed about three feet from the aquarium, throw a bright light on the aquarium in the region of the fish. Should the fish finally move away or just out of the zone of light, rotate the table until the light covers his entire body. See if, by repeating this process, you can drive them back and forth between the ends of the aquarium. It would be interesting to see if they react toward colored light as toward white. Bateson found no appreciable difference in the reaction toward white and colored light among the species tested by him.<sup>1</sup> Give to a species of day feeders food at night,—note their behavior by means of a dark lantern.

*Hearing.* Ichthyologists<sup>2</sup> are generally agreed that fish do not hear sounds transmitted by air waves.<sup>3</sup> The ear apparatus is usually interpreted as an organ for equilibration. They do respond to vibratile motions imparted to the water by solid bodies. Some fish are known to make noises, and even musical sounds which are heard by other fishes of their kind. Would acuteness of hearing be of any advantage to the fish?

*Emotions.* The works of Romanes, Brehm, Günther, Darwin, Abbott and others cite instances of the activities of fish that are expressive of fear, pugnacity, social, sexual and parental feelings, anger, jealousy, play and curiosity. How many of these emotions do you notice?<sup>4</sup>

#### CHICKS.

"I have now described, perhaps in undue detail, a few of my observations as noted down at the time. To some they may seem trivial, and scarcely worth the making and the noting. To us, as students of comparative psychology, their interest lies in the light they throw on the beginnings of psychical life and activity in the chick or duck."—*Morgan.*

<sup>1</sup> Bateson, W.: *Loc. cit.*, pp. 251-252.

<sup>2</sup> Lee, F. S.: A Study of the Sense of Equilibrium in Fishes. *Jour. of Physiology*, Vol. XV, pp. 311-348.

<sup>3</sup> Kreidl, Alois: Ueber die Schallperception der Fische. *Archiv f. d. ges. Physiologie*, 1895, Vol. LXI, pp. 450-464; also Ein weiterer Versuch über das angebliche Hören eines Glockenzeichens durch die Fische. *Archiv f. d. ges. Physiologie*, 1896, Vol. LXIII, pp. 581-586.

<sup>4</sup> From my observations on shiners, I am persuaded that they, at least, possess the capacity for feigning death. Pickerel will not eat dead fish—at any rate mine do not. Sometimes they are not successful at the first two or three attempts in seizing a shiner. These unsuccessful attempts greatly excite the small fish, which dart hither and thither pursued by the pickerel. The chase may finally be given up or the pickerel may seize one, after which all becomes quiet. It is at this period that the lucky shiner seeks a dark place and lies flat on one side as when dead. I have been deceived several times myself when, on going to remove them from the tank, thinking they were dead, they would dart with lightning speed to some new quarter.



The fact that chicks can be reared under test conditions and by the care of foster-parents, makes it possible to see more clearly just what responses are due to inheritance, *e. g.*, pecking, cuddling, making their toilet; and what are due to sense-experience, operating under the principles of association, *e. g.*, responses to agreeable and disagreeable foods.

*First Day. Senses*<sup>1</sup>. (a). While peeping in the shell,<sup>2</sup> whistle,<sup>3</sup> clap the hands near the egg, hold a tuning-fork near—is there a response to these sounds?

(b). After they have recovered from the "catastrophe of birth," repeat the sounds made in (a) and others that suggest themselves. Repeat this at ages 12, 24, 36, and 48<sup>4</sup> hours, respectively, and note the differences in responses both as to the increasing perfection of the sense of hearing and in the expression of the emotions.

(c). Has tapping on the floor near the food with a pencil any suggestive<sup>5</sup> value—through the auditory sense—to the chicks pecking?

2. Note behavior toward different odors, *e. g.*, spearmint, iodoform, cologne, cheese, asafoetida, etc. Odors may conveniently be presented on bits of cotton batting held by forceps.

3. At about the age of 12 hours test the field of vision by dropping bright bits of shell or meal before them. Move the food back and forth, up and down, before them. Do they peck at food beyond their reach?<sup>6</sup> Is it necessary to touch the eye to get a winking reflex?

4. Touch their feet with cold, medium, and quite warm wire—note the response in each case. Note fondness for sunshine.

*Instinctive Movements*.<sup>7</sup> (a). Note efforts to stand,<sup>8</sup> to walk<sup>9</sup> follow moving objects<sup>10</sup>—do they show preferences here? Note position of head and neck when sitting. Whenever possible early movements of other birds should be noted and

<sup>1</sup> Suggestions and directions for hatching chicks by means of an incubator may be had by writing to any reputable manufacturer of incubators.

<sup>2</sup> Morgan, C. Lloyd: *Habit and Instinct*, 1896, pp. 31-32.

<sup>3</sup> Hudson, W. H.: *Naturalist in La Plata*, 1892, pp. 99.

<sup>4</sup> Spalding, D. A.: *Instinct*. Macmillan's Magazine, Feb., 1873, Vol. XXVII.

<sup>5</sup> Darwin, Charles: *Expression of the Emotions*, 1872, p. 47.

<sup>6</sup> Preyer, W.: *The Mind of the Child*, p. 239. Translated by H. W. Brown, 1888.

<sup>7</sup> Preyer, W.: *Loc. cit.*

<sup>8</sup> Morgan, C. Lloyd: *Habit and Instinct*. Chapter 3.

<sup>9</sup> Mills, Wesley: *The Nature and Development of Animal Intelligence*.

<sup>10</sup> Groos, Karl: *The Play of Animals*. Chapter 3.

compared with those of chicks, *e. g.*, standing, walking, and swimming of the duck. (b). Make a list of all those activities that may be regarded as instinctive, *i. e.*, "congenitally perfect," as pecking, cuddling (do they show a preference here or do they cuddle indifferently under any object)? Do loud, sharp sounds shock or frighten them?

*Voice.* How many distinct sounds can be distinguished at this age?

*Second Day.* 1. Repeat experiments on the senses, adding to the list experiments on taste by giving them bits of lemon and orange<sup>1</sup> peelings, or a bit of blotting paper of pronounced color saturated with quinine. Note with special care the increased perfection of sight and hearing.

2. Note all activities of food getting, such as pecking, seizing, bill-movements, swallowing, etc. Offer them water (water should not be offered earlier than the second day), and observe just how they come to drink. Offer them an earth worm, beetle, or the like, and note the effects of competition. Imitative<sup>2</sup> acts are liable to occur at the end of the second and the beginning of the third day. For discovery<sup>3</sup> and accurate description they require careful observation.<sup>4</sup> What is the nature of the activities imitated, racial or acquired?

3. Observe the following: (a) certain activities fading out, (b) new ones appearing,<sup>5</sup> *e. g.*, preening feathers, flapping wings, wallowing, scratching—will they scratch on a bare surface, or do they require a bit of sand or grain to touch off the scratching apparatus? these may not occur until third and fourth days. (c) Are there any which they do from individual experience?

*Memory and Associations.*<sup>6</sup> To study the formation of associations in the chick the sense of taste may easily be employed. Offer them some bitter or disagreeable substance of a pronounced color as food. The number of experiences which the chick has with the disagreeable substance before it avoids or neglects it altogether is a rough measure of the time required for a permanent association to be formed between the color of the food and its disagreeable effects when taken into the mouth<sup>7</sup>

<sup>1</sup>Hunt, H. E.: *Am. Jour. of Psychology*, 1897, Vol. IX, pp. 125-127.

<sup>2</sup>Morgan, C. Lloyd: *Loc. cit.*, pp. 166-185.

<sup>3</sup>Romanes: *Mental Evolution in Animals*, pp. 222-223.

<sup>4</sup>For imitative movements in the child, see Preyer: *The Senses and the Will*. Tr. by H. W. Brown. pp. 282-292.

<sup>5</sup>James, W.: *Psychology*, Vol. II, pp. 394-402. See Transitoriness of Instincts.

<sup>6</sup>Thorndike, E. L.: *Animal Intelligence*. Supp. *Psy. Rev.*, 1898, pp. 65-78.

<sup>7</sup>Morgan, C. Lloyd: *Introduction to Comparative Psychology*, 1894. Chapter 5, Association of Ideas in Animals.

An experiment of this sort may require several successive days of observation. The permanency of the association should be tested by offering the objectionable substance several days apart.<sup>1</sup>

*Third Day. Instinctive Activities.* Note the first appearance of attempts to scratch the head, to wallow, to play, and under what conditions these things occur.

*Emotions.* Joy, fear, anger may be expressed at this age.

*Solitude and Society.* The effect of solitude may be observed by isolating one chick completely from his kind—not even letting it hear the voices of other chicks. Feed it on a limited variety of diet. At the end of four or five<sup>2</sup> days, introduce it to a flock that have enjoyed society and a larger variety of experience. Observe its initiation into this larger world.

The above outline, covering the first three days of chick life, and indicating the kind of observations to be made for the advantage of psychology may be continued with profit twelve to fourteen days, the duration depending largely upon the problems set for the chicks to do.

#### THE WHITE RAT.

"No ghost story or tale of horrid murder has been considered quite complete without its rat peering from some dark corner."—*Cram*.

To Mr. Willard S. Small I am greatly indebted for both the form and matter of this section. The outline here presented by Mr. Small for studying this rodent is based on his own very painstaking investigations, which have extended over nearly two years. With appropriate variations—dictated of course by the instincts, dominant traits, etc., of the rodent to be studied, the outline may serve for further investigations on other members of that family.

The white rat presents some modifications of the psychical character of his wild congeners,<sup>3</sup> but these are comparatively slight. The description given by Brehm<sup>4</sup> of the character of *mus decumanus* applies to the domesticated white rat with almost equal accuracy. The principal difference in psychic outfit is the inferiority of vision in the white rat. The eye is unpigmented and seems to be a much less important instrument than with the wild varieties.<sup>5</sup>

On account of their early maturity, healthiness (under nor-

<sup>1</sup> Kline, L. W.: *Am. Jour. of Psychology*, Vol. X, p. 273.

<sup>2</sup> *Ibid.*, pp. 271-272.

<sup>3</sup> Brehm: *Thierleben* (Säugethiere, Vol. II, p. 342 ff.). A characterization of the species *Muridae*.

<sup>4</sup> Brehm: *Loc. cit.*, p. 349.

<sup>5</sup> Rodwell, James: *The Rat* (London: Routledge and Sons) is a mine of anecdotal literature upon the rat,

mal conditions<sup>1</sup>), gentleness and cleanliness white rats are well adapted for experimental studies.

1. *The Psychic Development of the Young Rat.* The white rat, born blind and deaf, passes through two distinct phases of psychic development:<sup>2</sup> the period before, and the period after, sight and hearing begin to function. The method in this section is to follow the development of the animal's psychical activities from birth until the age of five or six weeks. The only factor appearing after this age is the sex instinct. This appears about the ninth or tenth week.

SENSATION.<sup>3</sup> *First day.* 1. *Smell.* Test<sup>4</sup> with several substances, *e. g.*, fresh milk, cologne water, hydrochloric acid. Observe: (a) the character of the reactions—how many kinds? (b) whether the reactions seem to indicate pleasure or displeasure in each case; (c) can you distinguish between the act of sensing and the motor reaction? (d) do you distinguish the vibratory movements of the nostrils so characteristic of the rodents?

2. *Taste.* Open the mouth and place upon the tongue: fresh milk, honey or sugar solution, aloes or quinine solution, or other substances. Observe: (a) the reactions; (b) whether they seem to indicate discrimination of tastes.<sup>5</sup>

3. *Tactile Sensibility.* (a) Touch the skin lightly on various parts of the body; (b) draw a bristle across the back, flank or side, and over the nose; (c) pinch very lightly the tail, foot, and sides or flank; (d) touch any part with a cold wire (32°), and then with a hot wire (not hot enough to burn); (e) notice also the rats' extreme sensitiveness to changes of atmospheric

<sup>1</sup> The following conditions should be observed: (1) the rats must be kept in a warm room—temperature not lower than 50° F.; (2) the floors of the cages should be covered one inch deep with clean sawdust; this should be changed at least once a week; (3) the cages should be so arranged as to protect the rats from strong light; (4) a simple diet of dog biscuit and milk and occasional green stuff, *e. g.*, apples or lettuce, gives good results. Fresh water each day. Offensive odors are minimized by carefully observing (2) and (4).

An excellent observation cage may be made as follows: dimensions, length, 20 inches; height, 16 inches; width, 16 inches; floor, back, and top of wood; one end of wire mesh ( $\frac{1}{4}$  inch) for ventilation; front and other end of glass. This insures observation of all activities, and is large enough for the introduction of necessary apparatus.

<sup>2</sup> Mills, Wesley: *Animal Intelligence*, p. 167.

<sup>3</sup> In connection with the observations upon sensation, it will prove interesting and suggestive to note the conditions of the sense organs.

<sup>4</sup> Bits of paper held by forceps are convenient for this purpose. The odorous substance should be held from 2 to 5 mm. from the nostrils. Other odors and irritating fluids should be used. For similar tests upon other rodents, cf. Mills, W.: *Loc. cit.*, p. 234, 241. Distinguish carefully between the effects of odors and irritating fluids.

<sup>5</sup> Mills, Wesley: *Loc. cit.*

temperature as indicated by rapid lowering of bodily temperature and retardation of heart-beat when brought from the nest into a cooler atmosphere; (f) observe also their apparent satisfaction when covered with the hand.

4. "*Sense of Support.*"<sup>1</sup> Place the young rat near the edge of the table, and note whether it crawls off or hesitates at the edge and shows uneasiness.<sup>2</sup>

5. "*Sense of Position.*"<sup>3</sup> Place the rat upon a pane of glass in horizontal position, with the sagittal axis of body parallel with two sides of the pane; then tip the pane—each end and side in turn—and note the angle required to elicit a response, *i. e.*, an effort to compensate the inclination of the pane.

*Second to fifteenth day.*<sup>4</sup> Follow the same line of observation, noting these more general points.<sup>5</sup>

1. *Smell.* (a). The tests may be made with the same substances, or variations may be introduced. In the former case, note the effect of growing familiarity upon the reactions; (b) note whether there is any diminution in the time required for sensing the stimulus; and (c) distinguish between sensing of stimulus and motor response.

2. *Taste.*<sup>6</sup> The experiments need not be repeated more than twice during the first week; after that, every second day.

3. *Instinctive Activities.*<sup>7</sup> *First day.* 1. When the young rats are held in the hand, observe their tendency to roll up into a ball. 2. Place them upon a smooth table and observe their efforts;<sup>8</sup> (a) to stand, (b) to crawl, (c) to hold up and move the head from side to side; (d) observe further whether they seek to get together; explain the reason of this movement and consider whether it has any significance for

<sup>1</sup>Mills, Wesley: *Animal Intelligence*, pp. 118, 150, 176, 225. Morgan, C. Lloyd: *Habit and Instinct*, p. 107.

<sup>2</sup>This experiment *may* be impracticable the first day on account of the limited locomotion of the rats.

<sup>3</sup>Sanford, E. C.: *Experimental Psychology*, p. 36. Lee, F. S.: *Jour. of Physiology*, Vols. XV and XVII.

<sup>4</sup>Weigh the rat and measure length of body and head from time to time.

<sup>5</sup>Mills, W.: *Loc. cit.* Prof. Mills's work should be familiar. The differences brought out in his studies, between young animals of different species, are most instructive. Preyer, W.: *The Mind of the Child—the Senses and Will.* (Tr. by H. W. Brown.) p. 257 ff.

<sup>6</sup>The experiments on taste and smell may be varied profitably by introducing the factors of hunger and satiety. Compare rats taken at random from the nest with some that have been segregated for two to four hours, according to age. (N. B. Keep them warm.)

<sup>7</sup>Morgan, C. Lloyd: *Habit and Instincts*. Ch. 5. For a discussion of "Instinct," cf. Ch. 1. Also Groos, Karl: *The Play of Animals*. Marshall, H. R.: *Instinct and Reason* (MacMillan, 1898). James, W.: *Psychology*, Vol. II, Ch. 24.

<sup>8</sup>For comparison with other rodents, cf. Mills, W.: *Loc. cit.*

the origin of the "social instinct." 3. Turn them over upon their backs; note their efforts to turn over upon their bellies; note also the variety of movements in these efforts and the lack of muscular co-ordination.

4. Try to observe the sucking activity from the first.<sup>1</sup> (a) Do the new-born rats find the mother's teats immediately by a "congenitally perfect instinct," or is there accident in the process? (b). Do they suck any other part of the mother than the teats? (c). Does the mother render assistance?

5. Test their clinging power—letting them cling, unsupported, to your finger.<sup>2</sup> The attempt should be made constantly to infer the sensational and affective states correlative with the instinctive activities.

6. *Vocal Expressions.* Note carefully the number of sounds you can distinguish clearly, and what affective states they severally indicate.<sup>3</sup>

The eyes and ears begin to function about the fifteenth day. Between the second and the fifteenth days, two facts of a general nature relating to motor activities should be noted: (a) the increasing vigor of movements, and (b) definiteness of muscular co-ordination. Note especially, the progressively effective use of the paws in sucking.

In respect to vocal activities, it should be noted whether they increase in variety, and whether they are indulged in more or less frequently.

New features in development may be looked for as follows:

*About the seventh day,* note that they begin to move about more freely, selecting their paths to some extent and avoiding obstacles.

*Tenth to thirteenth day.* 1. Look for the appearance of some very characteristic "rat" activities: (a) orientation, by rising slightly upon the hind legs and sniffing about, when they are moved into a new place; (b) climbing up on the mother's back and up the side of the cage; (c) scratching the body with the hind foot;<sup>4</sup> (d) washing the face with the fore paws. 2. Observe about this time also that they may leave the nest and follow the mother in order to suck.<sup>5</sup>

<sup>1</sup> Mills, W.: *Loc. cit.*, p. 118 ff. Morgan, C. L.: *Loc. cit.*, p. 113. Hudson, W. H.: *The Naturalist in La Plata*, p. 106. Wallace, A. R.: *Contributions to the Theory of Natural Selection*, p. 206. Preyer, W.: *The Senses and Will*, p. 257.

<sup>2</sup> Robinson, Dr. Louis: *Nineteenth Century*, Nov., 1891. (This instinct in the human child.)

<sup>3</sup> Contrast with rabbit, Mills, W.: *Animal Intelligence*, p. 134.

<sup>4</sup> This is called by Romanes a pure reflex. Cf. Romanes, G. J., *Darwin and after Darwin*, part 2, p. 80.

<sup>5</sup> I have seen one leave the nest and go directly to the mother, a foot away, eating her supper. Whether this was by chance or by smell is an interesting question.

A test for instinctive fear may be made by rubbing a cat and then presenting the hand to the nostril of the rats.<sup>1</sup>

At the end of the first period, it will be well to "take account of stock," summarizing the psychical elements that have now appeared, noting their time of appearance—congenital or later—and their order of development.

#### SECOND PERIOD.

The following suggestions for this period may serve for a general outline, to be varied or discontinued at discretion.

**SENSATION.** 1. *Smell.* Tests should be made now especially with food substances, *e. g.*, milk, cheese, honey, meat, etc. Tests may be made also with essential oils.<sup>2</sup>

2. *Test.* Discrimination of taste, by putting edible and non-edible substances into the mouths of the rats, *e. g.*, dog biscuit and sealing wag.

3. *Hearing.*<sup>3</sup> (a). Tests should be made for hearing just before the external meatus is completely open, by clapping the hands, clucking, hissing, whistling, etc. Be careful that a current of air is not thrown upon the rats with explosive noises. (b). Generally the sense of hearing becomes acute about the fifteenth day. (c). Try a number and variety of sounds, especially musical tones (a gamut of tuning forks is desirable). Also introduce variations in loudness.

In these experiments observe the small variety in the reactions at first. What is the inference?

(d). The test should be repeated daily for a few days noting the progress in discrimination of sounds and the emotional concomitants. (e). At the age of about three weeks, test for æsthetic sense in connection with sound.<sup>4</sup> An air played softly upon a violin or even sung softly will serve for test.

4. *Vision.*<sup>5</sup> Make tests as soon as the eyes begin to open. (a). Bring the rats into a strong light. (b). Strike the hand across the field of vision an inch or two in front of the eyes.

<sup>1</sup> Mills, W.: *Loc. cit.*, p. 176, 177. (I have not been able to confirm Prof. Mills's experiment with respect to rats. Cf. Morgan, C. L.: *Loc. cit.*, p. 117.)

<sup>2</sup> "Rats are enticed by certain essential oils." Darwin: *Descent of Man*, p. 530.

<sup>3</sup> Mills, W.: *Loc. cit.*

<sup>4</sup> Anecdotes of rats and mice being fascinated by music are so frequent and so well authenticated that this experiment is of peculiar interest. Cf. Weir, Dr. James: *The Dawn of Reason*, p. 116.

<sup>5</sup> It should be remembered that vision is the least efficient of the white rat's senses. A comparison should be made between the importance of vision and the importance of smell and hearing in the development of the young rats.



What effect in each case? Can you get a winking reflex without touching the eyes?

The experiment upon vision will probably be unprofitable after four or five days, except experiments for the determination of the distance at which the rats can see objects. These may be made at intervals as long as the study continues. These determinations may be made roughly by moving an unfamiliar object in front of the cage, carefully excluding all sound.

5. Observations of the common activities of the rats will yield information in regard to tactual and kinæsthetic sensations, and the sense of equilibrium.

INSTINCTIVE ACTIVITIES. After the eyes and ears are open, observe the gradual disappearance of some activities, the progressive perfection of others, and the appearance of still others.

A. *Vocal*. Even casual observations will show the diminution of vocal activity.

B. *Motor*. 1. Note the slow degeneration of the sucking instinct. 2. Orientation, climbing and washing are rapidly perfected. 3. New activities appear, 17th to 21st days. (a). Gnawing. They nibble at one's fingers, at food, and as early as the 21st day I have seen them gnawing a stick. (b). Digging. (c). Play activities—running, jumping, mock fighting, etc. They may frequently be seen licking each other. It is not apparent whether this is in play or whether they are searching for vermin.

At the end of four or five weeks the student should again "take account of stock" and catalogue the psychic outfit of his subjects. As all our knowledge of the animal mind is inferential, the same observations will serve as basis for conclusions as to instinct, general intelligence and emotion in the rat. For example, the constant investigations of the waking rat will declare his curiosity. The eager expectancy displayed at the usual feeding time,<sup>1</sup> especially when they hear the rattle of the food, is evidence of memory. Fear is apparent at every unusual noise.

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<sup>1</sup>Rats should be fed in the afternoon.

## II.

## SUGGESTIONS FOR EXPERIMENTAL STUDY OF INTELLIGENCE.

The preceding study of the young rats will have brought out the rat character sufficiently to warrant the setting of a good many tasks. For example: hunger, sociability, and curiosity may safely be appealed to as motives for the performance of tasks; climbing, digging, and gnawing are patently instinctive and persistent activities.<sup>1</sup>

Two practical suggestions for apparatus are appended. In each case aptness for learning, imitation, and memory may be tested. The rats should be at least six or seven weeks old.

1. The apparatus consists merely of an ordinary squirrel revolver. A revolver 10 inches in diameter and one foot long can be used in the cage described above, and it is better to perform the experiments in their accustomed place.

(a). Keeping the door of the revolver open, note the time required for the rats to learn to run the revolver.<sup>2</sup>

(b). After the rats have learned this lesson, a test of imitation may be made by introducing one or two uninitiated rats into the cage. The difference in time required to learn the lesson may be taken as a rough measure of imitation.

(c). Furthermore memory may be tested by removing the drum for a time and noting the results upon its return.

This experiment may be variously complicated. For example, after the rats have learned to run the revolver, the door-way may be closed with a spring door such as is described in connection with the next piece of apparatus.<sup>3</sup>

2. Two pieces of apparatus. In both cases the motive appealed to is hunger. The activity in one case is digging; in the other, gnawing.

(a). Exp. box 1. A box<sup>4</sup> 7 inches square and 6 inches high; sides of wire mesh,  $\frac{1}{4}$  inch mesh; top, glass; bottom, wood. At one side of bottom, a hole  $3\frac{1}{2}$  by 2 inches is cut. Two strips of wood  $1\frac{1}{2}$  inches thick tacked to the bottom raise the box above the floor of the cage. Sand and sawdust are banked about the box just above the level of the floor. Food

<sup>1</sup>This enumeration is merely a suggestion; it is not intended to cover the field.

<sup>2</sup>Other interesting things will be observed: *e. g.*, if there is any straw or litter in the cage, they are very likely to carry it into the revolver and make their nest there.

<sup>3</sup>In all these experiments the experimenter must be prepared for individual variations.

<sup>4</sup>The apparatus and the method is more fully described by Dr. L. W. Kline, *Am. Jour. Psychology*, Vol. X, No. 2, p. 277. The diary of a few days' experimentation is given.

of some kind<sup>1</sup> is placed in the box and the top fastened down. At the usual feeding time, Exp. box 1 is placed in the cage and banked up as described. There is nothing to mark the place of entrance. This experiment should be repeated daily till the lesson is completely learned, so that the rats go at once to the right place and dig into the box.<sup>2</sup>

(b). Exp. box 2. The same as Exp. box 1, except that the floor is solid and the entrance is on one side. The entrance is an opening,  $2\frac{1}{2}$  inches square. This opening is provided with an inward swinging door of sheet zinc, hung from the top. The door is attached by a spring<sup>3</sup> (an ordinary rubber band) to the top of the cage, so that when free it is held open. The door is held closed by means of narrow strips of stout paper stuck, with sealing wax, to the door and the lower edge of the box. Admission to the food within can be attained only by biting, pulling or scratching off the paper. This experiment, too, should be repeated daily until the habit of getting the food by removing the papers is formed.

The two experiments yield the same results in regard to the determination of instinct, intelligence, and habit.<sup>4</sup> The two should be carried on contemporaneously with two pairs of rats. Some interesting comparisons will in the form of discrimination be apparent.

A further study of intelligence may be made, after the two pairs have mastered their lessons, by interchanging the boxes.

After this new task has been performed, the problem may be complicated still more by alternating the boxes at unequal intervals. If it is desired to test even further the adaptability of the rat, other complications or variations may be devised.

Careful analysis of these experiments will reveal the parts played by the different psychic elements: the instinct feeling of hunger (and curiosity too, perhaps,) the instinctive activities employed, recognition, memory—these all combining to form complex associations.

#### THE CAT.

"The cat seems to be a much more intelligent animal than is often supposed."—*Mivart*.

"Indeed no greater contrast in table manners can be observed anywhere than when we turn from the kennel or the pig sty and watch the dainty way in which a cat takes its meals."—*Robinson*.

"In will-power, and ability to maintain an independent existence the cat is superior to the dog."—*Mills*.

<sup>1</sup>I use nothing but dog biscuit. The rats must not be over fed.

<sup>2</sup>Not more than two rats should be set to this task at once.

<sup>3</sup>A small hook soldered to the lower part of the door serves to attach the spring to the door.

<sup>4</sup>Kline, L. W.: *Loc. cit.*, p. 279.

A psychological study of the cat,<sup>1</sup> or allied species, will be more profitable and certainly more pleasant to both student and cat if the former bears in mind the dominant cat traits: She is independent of man from a vegetative standpoint; self-willed, will not brook restraint; she is slow to forget an injury and often resents it; enjoys kind treatment; she is for the most part solitary in her habits.

The senses, instinctive activities, the emotions, the formation of habits, and the growth of intelligence constitute the essential material for observation and investigation.

The *order* in which the senses develop, and likewise the order and the conditions under which the instinctive movements and the expression of the emotions occur, should first engage the attention, and that, too, not later than the second day.<sup>2</sup>

*Sense of Smell.* Cheese, meat, warm milk, carbolic acid, etc., may be presented as objects of smell. Can you distinguish between the act of sensing and the motor reactions?

*Sense of Taste.* Solutions of sugar, salt, and aloe may be applied to the tongue by means of a feather or camel's hair brush. Milk, vinegar, and meat juice may be similarly applied.

*Touch.* Reaction to the sense of touch may be solicited by touching the sole of the forepaw, the mouth, inner surface of the nostrils and the ear with a broom straw, or knitting needle.

*Temperature.* Heat an iron rod to an uncomfortable degree to the human skin (not hot enough to burn) and place it against the sole of the kitten's foot.

*Pain.* Pinch different parts with forceps or fingers—note the *latent* time before the response. Does the latent time shorten with age?

*Sense of Support.*<sup>3</sup> (a). Uneasiness manifested by cries, and gripping the supporting surface vigorously with its claws, when it crawls to the edge of the same, is interpreted as a response to a disturbance of the sense of support.<sup>4</sup> If convenient make the same experiment with a turtle, a puppy, an ant, a slug, a chick. (b). Place the kitten on a board 12 x 14

<sup>1</sup> Brehm: Thiereleben (Säugethiere, Vol. I, pp. 461-480.); J. Hampden Porter's Wild Beasts, pp. 76, 305, contains many significant observations on the habits and traits of Felidae.

<sup>2</sup> Prof. Wesley Mills is the first scientist to have observed daily the psychic development of the cat from birth to maturity. Many of the above suggestions are founded on Prof. Mills's work. See also Bernard Perez: Mes Deux Chats; Fragment de Psychologie Comparée, pp. 39-78. Paris, 1881.

<sup>3</sup> See literature under Rat.

<sup>4</sup> Prof. Mills says: "This seems to me as fundamental as anything that is to be found in animal psychology."

inches, the sagittal axis coinciding with the length of the board. Tip the board slowly by raising one side until the kitten perceives the new position. Tip the forward end in the same way, then the rear end—note the angle that the board makes with the horizon in each of the positions.<sup>1</sup>

*Reactions to Rotation.* Place the kitten on a small rotation table—head toward the periphery. Turn the table at a moderate rate through one rotation—note the direction of the first movement after the table stops.

*Hissing.*<sup>2</sup> This mode of expressing a certain group of emotions is natural only to the *Felidae*, *Reptilia*, and a few birds. What stimulus provoked the first hissing sound. How many kinds of hissing sounds can you detect in the kitten? Note the same points with regard to spitting.

*Tail and Ear Movements.*<sup>3</sup> The movements of these pendant organs are for the most part instinctive, though in the case of the ear they would seem to be more of the nature of a reflex. Their quivering motion is a curious phenomenon.

*Sight.* Eyes open about eighth day—note shape, color, the distance at which objects are recognized, when the kitten first follows a moving object by turning the head and by rolling the eyes.

Special directions for observation and experimentation on the kitten after the tenth day are not only useless but a positive hindrance. No two observers are likely to surround the young cat with the same environment and conditions; therefore, in the matters of habit and intelligence, each place will have its own special problems. But the appearance of instincts and emotions peculiar to the cat will occur under all favorable conditions, so that it may be helpful to indicate what to expect or look for as the psychic life of the cat unfolds. Look then for the first appearance of spitting, hissing, making its toilet,<sup>4</sup> playing with inanimate objects,<sup>5</sup> chasing moving objects, stretching and yawning, especially after a nap or leaving its nest, enjoying being stroked, setting claws into upright objects, tree-climbing, purring, crouching, "lying in wait," bowing the back in rage, playing "with real living prey," *e. g.*, a mouse,<sup>6</sup> playing "with living mock prey,"<sup>7</sup> *e. g.*, its mother or another

<sup>1</sup> "(b)" is not an experiment to test the sense of support, but rather that of "position."

<sup>2</sup> For a probable origin of hissing and tail wagging, see Louis Robinson, "Wild Traits in Tame Animals." London, 1897, pp. 228-264.

<sup>3</sup> Ingersoll, E.: *Wild Neighbors*. See chap. "The service of Tails."

<sup>4</sup> Robinson, Louis: *Loc. cit.*, pp. 262-264.

<sup>5</sup> Robinson, Louis: *Loc. cit.*, pp. 228-229.

<sup>6</sup> Groos, Karl: *The Play of Animals*, pp. 121 and 130.

<sup>7</sup> Mills, Wesley: *Loc. cit.*, p. 196.

kitten. How many of these activities can you account for? What is their significance in the economy of cat life? A study in the formation of associations and their consequent habits, may most naturally begin (a) by observing the kitten in learning its name. Make a record of the number of times the name is uttered until it is recognized by the kitten. While teaching it, the name should be used judiciously, and always in immediate connection with a pleasurable reward, *e. g.*, food, stroking, giving it a play object to which it has become attached.

(b). Select from among its play activities, one that the cat may be readily induced to repeat (this the observer must decide), then create conditions that will call forth a second one that has a pleasure giving or satisfying effect. Note the number of times necessary to create the new condition that shall call forth the second act without hesitation. The following account of an actual case will illustrate the point. After the young cat had become accustomed to play with a ball, a long string was attached to the ball by which it was withdrawn gently from the cat and dropped into a work-basket. The cat saw the whole performance and immediately took the ball from the basket and continued the play for a few minutes when the ball was jerked away and dropped into the basket with the quickest possible despatch. After two experiences, *i. e.*, at the third time the ball was jerked away, the cat went directly to the basket. The experiment may be varied—basket moved before the ball is jerked into it, a different basket used, etc.

Under this head would come teaching<sup>1</sup> some of the well known

<sup>1</sup> A radically different method for studying associative processes from those given in (a) and (b) has been used by Dr. Thorndike. (Thorndike, E. L.: *Animal Intelligence*, p. 6. New York, 1898.) "It was merely to put animals when hungry in enclosure from which they could escape by some simple act, such as pulling at a loop of cord, pressing a lever, or stepping on a platform. . . . The animal was put in the enclosure, food was left outside in sight, and his actions observed. Besides recording his general behavior, special notice was taken of how he succeeded in doing the necessary act, and a record was kept of the time that he was in the box before performing the successful pull, or clawing, or bite. This was repeated until the animal had formed a perfect association between the sense impression of the interior of that box and the impulse leading to the successful movement." I recommend that the food be put *in the box* and the animal on the *outside*, free, unhampered, and that the several tasks set by Dr. Thorndike for the animal to do in order to escape be accordingly transferred to the outside of the boxes. I have found this method to work admirably well with the white rat, and the cat. See *Am. Jour. of Psychology*, 1899, Vol. X, pp. 277-279. The time required to perform each experiment, and particularly just how it is done, and whether or not experience facilitates the execution of the task, are among the essential items to be noted.

tricks, *e. g.*, rolling over, jumping through the hands, "begging" in upright position, shaking hands, etc.

Full notes are always valuable. While teaching them a task, the notes should be made as near as possible *at the time* of the experiment. It is highly important, too, that every circumstance attending the cat's first successful effort in doing a set task be carefully noted. If convenient, photographs should be taken; and especially of attitudes expressive of emotions that are usually so difficult to describe.



## THE EFFECTS OF MIND ON BODY AS EVIDENCED BY FAITH CURES.<sup>1</sup>

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Our remedies oft in ourselves do lie,  
Which we ascribe to heaven.

—*Shakespeare.*

Perhaps no question is forcing itself upon the attention of society, concerning which there is so little knowledge and so much prejudice, as the question of the value and rights, of the new methods of treating disease, included under the comprehensive term,—“Faith Cure.”

In some one of its forms it is making its appearance on all sides. The medical man has it to contend with: he finds a patient has left him to try a mental practitioner; or else he is called to treat a new patient upon whom “mind cure” has failed. The legal profession has occasionally to decide whether the mental healer is guilty of mal-practice, or the friends and relatives of a deceased person guilty of “culpable neglect” because they trusted to some form of mental therapeutics and did not consult the recognized doctors of medicine. The minister meets it as a more or less persistent theological doctrine, which he must either uphold or denounce. Finally, no person can see a friend enduring a lingering illness, unbenefited by the arts of the physician, without having this new method urged upon him, and without having at least the beginnings of a query in his own mind as to whether there is “anything in it” or not. And if the friend who looks on, how much more does the sick one himself, wearing out the weary hours of suffering, watching the weeks grow into months and the months into years, with no improvement, wonder if, since everything else has failed, it may not be worth while to try the prayer cure or hypnotism or Christian Science.

Whenever one of these people in any one of these different classes attempts to find a basis for a rational conclusion, or facts

<sup>1</sup>In this paper we have attempted to present a brief survey of the field, that portion of the data which is of most psychological interest, and some of the conclusions, from an extended study of mental therapeutics. We hope to present in a later publication an extended report of all the work referred to.

to help him to a wise decision, he invariably finds such a confusion that, as a rule, he gives up in despair.

*Mind cure* suggests psychology, and the psychologist is appealed to for the laws of mind which may explain the phenomena and give the rationale of the question. But the psychologist is silent; or at most can only say: "The relation of mind to body is unknown to us, and in the nature of things will probably never be determined."

It is the method of the "New Psychology," however, to collect all the facts possible, in relation to such questions, in the belief that, in time, these facts which at first are so isolated as to be without any apparent relation, may eventually be so numerous and so complete that they will fit into each other, and exhibit a more or less perfect picture.

It is believed, that even if this study yields no new relations in psychology, it at least puts together facts that may sometime be of value to the psychologist, and will at once appeal to all who are interested in the practical side of ameliorating human ills.

In the following pages, we propose to give a brief account of the principal forms under which the practice of treating disease without drugs, appears; next to show the relation of these to each other; and finally select one—the so-called Mental Science—for a fuller treatment. This will be followed by such explanation as we are able to give by correlating it with more scientific practices in the same line; concluding with a little speculation on some of the deeper problems suggested by the facts presented.

We have alluded to "Faith Cure" practices as among the *new* methods of treating diseases. As a matter of fact the principle is as old as human history, and only certain claims and certain methods of applying it are new. Of these new forms probably the most pretentious as well as the best known is Christian Science. The school of "Healers" known as Christian Scientists, own allegiance to, and claim as the discoverer of the practice, Mary Baker Glover Patterson Eddy. The book which contains the doctrines of the sect is believed to have been written by Mrs. Eddy under divine inspiration.

Mary Morse Baker was born in Bow, N. H., July 21, 1821. Her father was of Scotch descent. As a child, Mary was sickly and hysterical; not able to attend school much and consequently received very little education. December 12, 1843, she married George W. Glover, an architect, of Wilmington, N. C. Mr. Glover died suddenly of cholera in May, 1844. One child—a boy—resulted from this marriage. After about fourteen years she married Dr. Patterson, a dentist, of Franklin, N. H. He was a man of excellent character, and did everything possible for his wife. In 1862, Mrs. Patterson went to Portland

to be treated by Dr. Quimby's mental methods of curing disease. In 1865 she obtained a divorce from Patterson. Her first publication was copyrighted in 1870, and she published "Science and Health" in 1875. In 1877, she married Asa Eddy, of Lynn, Mass. In 1879, she organized a "mind healing church," of which she became pastor in 1881. She also established her "Metaphysical College" in 1881. Her husband, and also her adopted son, Foster Eddy, assisted her in the college. Mr. Eddy died suddenly in 1882. In 1889, she closed her college, and since then has devoted herself to the advancement of Christian Science theories through her writings. The growth of the organization has been rapid and large. Mrs. Eddy now resides in Concord, N. H., and is seldom seen even by her most devoted followers. "Science and Health" is in its 160th edition, and her other writings have passed through many editions.

These writings, particularly "Science and Health," contain the authoritative creed of the organization, the foundation of their theory and practice. The teaching is a sort of absolute idealism. Mind is divine; mind is all. Sin and sickness are delusions of "mortal mind." The "treatment" consists in the assertion that sickness is not a reality but only a "belief." The acceptance of this view by the patient is the cure sought for.

The following account, received from a Christian Scientist healer, in answer to our syllabus, will probably give as clear an idea of the philosophy, theory, and practice of Christian Science, as it would be possible for us to give in the space at our disposal.

I suppose the object in sending me these questions to answer is to learn the character of Christian Science method or principle of healing; and so the answers take up the subject as viewed from that standpoint. If you find them unintelligible or unsatisfactory, it is because of the wide difference between the bases of methods built up from a material, mental or bodily cause, and a wholly metaphysical being.

*Please relate the facts connected with the cure of any physical ailment, without medicine. Mention in same way any disease prevented in similar manner.*

The facts as revealed by a study of Christian Science, show that the only agency ever effective in curing disease, is some faculty of mind; that matter having no potency in and of itself, it follows that the exercise of mental belief, ascribing certain degrees, qualifications and results, either to the drug or material process, is what restores the patient. But suppositional faith, basing its reasoning on the evidence of one or more of the physical senses, is unreliable, since it can only reason uncertainly from effect to cause; causation thus being an unproven hypothesis, liable to be found only another effect on deeper investigation.

Christian Science shows such reasoning to be useless, since not understanding how the phenomena of disease is dissipated, the patient

is liable to recurrence in the same or another form, and is unable to prevent or to cure himself.

Christian Science starts with a demonstrable fact for its causation, found in a self-evident, self-existent Principle of Mind, and reaches an understood and knowable cure through its application in a scientific process.

*What was the nature of your malady?*

It had none. Disorganization is not an entity to be characterized.

*How long had you been afflicted with it?*

Ever since the belief that disease was a substantial entity, instead of a negation.

*How did you first discover that you were a victim of disease? Give fully your symptoms.*

By a consciousness of limitation, i. e., finiteness.

*How did the idea come to you that you could be healed? If suggested by some person, what was your estimate of that person?*

The conviction that limitation was an error, as shown by the inability and suffering it brought; and that it was right to be well; and sickness was a wrong.

Suggested by a sense of justice.

*Was your cure instantaneous?*

Yes.

*If so, how did you know that you were cured?*

By the instant receding of disease; and the corresponding increasing of health and strength.

*Did you know it at the time, or not until later?*

At the time; since mind first perceiving the truth, its objective manifestation begins to appear.

*Did you have to test it, before becoming convinced that a cure had actually taken place?*

No; it brought its own self-evident proof with it.

*If not instantaneous, how rapid was it? How do you know that it was any more than a natural recovery?*

It was natural recovery. There is no other genuine recovery, since health (omipotent and self-existent intelligence), when left to itself, without any erroneous interference, will do its own work naturally.

*Was there any new feeling in the diseased part at time of recovery, or in any part of the body? If so, describe and explain what you thought it meant.*

No. The disappearance of sensation left the body free to respond to any use the mind would have for it.

Since the more intense the sensation, the more powerless the organ to act harmoniously; it follows that the theory that matter is conscious intelligence, is a causative error, expressing itself in disease. Christian Science proves this true, for, by correcting this mistaken theory, the afflicted organ is relieved, and becomes free to be adapted to any action the mind may demand of it.

*Have you ever doubted your complete cure, or had a relapse? If so, give reasons for your first doubt, or the occasion of your first realizing that you were not permanently cured? To what do you attribute the relapse? To what your cure?*

No. A principle is a complete whole, hence can manifest nothing less. Any appearance of relapse or failure comes from lack of principle. 1st, to the fact that mind creates all phenomena. 2nd. That the instant a fact is seen to be true, all previous theories, regardless of age or sup-

posed substantiality, disappear as realities from that mind. 3rd. That the phenomena of the theoretical conception also vanishes with it, since effect cannot exist without its cause.

*If you have ever tried to get healed by any of these methods, and failed, relate the circumstances.*

Failure followed every effort to find health, until Christian Science was understood and demonstrated. Allopathy, homeopathy, hygiene, rational systems, surgery, sanitarium treatments, mind cure, will-power, all failed.

*To what do you attribute your failure?*

To a mistaken belief that the eternal mind-principle of health was a material condition; that it could be lost and re-created by some material mechanism, and was dependent upon physical conditions for its existence and manifestation.

*Please answer the following questions relating to your own personality, with great care. Age? Temperament? Disposition? Complexion? Married? Do you now, or did you as a child, choose or avoid responsibility? Did you, or do you, prefer solitude or companions? Were you precocious, backward or normal, in the matter of learning to write, walk or talk? What was your health in childhood?*

This paragraph is unanswerable from Christian Science basis, since it deals with mentality only, and recognizes physicality as the manifestation of mistaken, changing, human belief; having no fixed character of its own, and subject to constant correction.

*If you were healed in answer to prayer, kindly describe the circumstances, and answer the following questions in addition to the above.*

If by prayer is meant a petition to set aside fixed law and its penalties to please some favored petitioner, decidedly, no. If it means a humble, steadfast desire for spiritual, mental, and bodily wholeness, recognized as a God-given right to all, to be received in proportion to man's intelligent understanding of the God-nature and its operation; yes.

*What had been your religious experience previous to your cure?*

I found nothing in popular religions or philosophies of any practical value.

*What was your idea of the efficacy of prayer?*

It had none beyond a blind faith in the petitioner, resulting in a manifestation of self-mesmerism.

*How did the faith that you could be cured, first come to you?*

Realizing the fact that disease was discord, led me to seek every means possible to find the harmony which is health.

*State any doubts that you had.*

Neither doubts nor certainties; as it was simply another experiment.

*What plan had you formulated, or what conditions did you expect to have to fulfill before you could be healed?*

Obedience to any requirement; as would be expected in giving a fair trial to any system.

*Did it happen as you had planned, or did you change your views of the matter? If the latter, how did you come to change your views?*

The positive proof of the disappearance of disease, left no room for questioning the presence of health or the success of the means employed.

*Was the final result in any way contrary to your expectations? If so, how?*

I had no expectations.

*What physical sensations, if any, accompanied your restoration?*

None whatever.

*Had you any previous conception as to how the cure might take place?*

No.

*What was your mental and religious state at the time of the cure?*

Having been a student of various philosophies and material sciences, both mental and religious conditions were the essence of materialism.

*Did you seem to have any "revelation," or was there any "manifestation," as of "angels" or "flames" or "voices," or any such thing?*

Not the slightest.

*Was it comparable to any of the cures wrought by Jesus, or any other case of which you had heard or read?*

It was comparable to the cures wrought by Jesus, in that as we who are healed in Christian Science to-day, so with the people of those days; after "suffering many things of many physicians," found disease not lessened and often increased; turned as a last resort to the Master Healer. In like manner, by the same demonstrable principle which Christian Science finds He worked by, the sick are healed to-day.

*What effect has your cure had upon your religious life?*

My cure, study, and demonstrations of Christian Science, prove to me the existence of a practical, scientific theology, whose principle demonstrates itself to be true, in its power over sin, sickness, death, and all discordant conditions in material environment.

It proves the Sermon on the Mount, and the Kingdom of Heaven on Earth, to be present possible standards for humanity to live by, in proportion as each one accepts the standard and obeys the rules which Christian Science shows to be the way to gain this harmony of Infinite love.

*If you were healed through the influence or mediation of some person or "healer," or "hypnotizer," kindly describe the appearance and character.*

The healing of Christian Science is not through any influence or mediation of a healer.

The patient goes to a so-called healer, through a mistaken idea that the healer possesses some ability or understanding which he has not. Like an elder brother, the so-called healer corrects this mistake, as well as others, through mental processes, until the patient's mind is in a condition to be corrected audibly, and shown how the work is done directly for himself.

Any seeming failure in cures arises from lack of adherence to its principle, either in patient, healer, or both.

*Please mention any books bearing on these subjects that you regard as good.*

The only text-book of genuine unadulterated Christian Science is "Science and Health, with Key to the Scriptures," by Rev. Mary Baker G. Eddy. Published in Boston.

We will add one more.

DEAR SIR: I cannot send you returns. To a student of Christian Science there is no psychology, for there is but one soul even as there is but one God. God is soul. Man reflects soul, for man is "made in the image of God," but soul is not in man; the less cannot contain the greater. And whereas before I was healed from chronic invalidism through the "teachings of Christian Science" I used to think much on your topics, I wish never to think or refer to them again; cannot and be consistent or obedient to the teaching which heals. They are mental poison to me.

May I please express a wish for you and all that are making a "scientific study," all who are seeking for knowledge—a wish that you and they might be induced to study the Bible in the light of "Science and Health with Key to the Scriptures," by Mary Baker G. Eddy.

Yours in truth,

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Christian Science is an offshoot from another school which we shall term Mental Science—a term quite generally used by those who practice this form. Mental Science may be said to have originated about the middle of this century through the efforts of P. P. Quimby.

It differs from Christian Science in that it acknowledges no allegiance to any one man, and does not claim to be a special revelation from God, but seeks the basis for its theory in the teachings of the old philosophers or modern mystics, and especially empirically in the results of its practice in the realm of therapeutics. It has not the explicit religious form of Christian Science. It is a philosophy, a theory of life. We give a fuller account of its theory and practice in a later portion of this paper.

Another form of curing disease without medicine is the so-called Divine Healing. Under the general idea that God heals disease in answer to the prayer of faith, we find many variations in the method, or rather the ceremonies accompanying it, and some little disagreement as to the strict theology of the process. But since they all produce results, it may be assumed that the differences do not go further than the minds of the healers, and that the real principle lies deeper than individual theories.

Of course it goes without saying that the whole practice is based upon the Bible, and the differences are the result of differences in interpretation. One division anoints with oil according to the suggestion of the Apostle James. Another heals by the laying on of hands, according to the practice of the other Apostles. While a third set discards all types and formalities and simply prays for the afflicted one. It is generally agreed by all, that the result is according to the faith of the sick one, and the fact that any particular prayer is not answered is evidence that the patient did not have sufficient faith. There are, however, those who argue that it may be the will of God that a person should endure sickness, and by such, a resignation to the will of God is encouraged.

Rev. A. B. Simpson, of New York City, is one of the leaders in this work. His teaching is peculiar in that he argues that when once a person has prayed for healing it is dishonoring God to doubt the cure or to ask for a sign or symptom. The person must claim he is healed and expect it. This accounts



for the many people who claim to be healed but whose appearance contradicts their words.

Many oppose this view and hold that it is claiming a lie to assert that one is healed when he is not. The chief opponent, and the most pretentious healer is the Rev. John Alexander Dowie, of Chicago.

A brief account of Dr. Dowie, will not be out of place here. And fortunately we can give it in his own words as published in his own *Leaves of Healing*, for Dec. 11, 1896. It gives not only the facts of his life but his style, method, and manner of preaching (for this is part of the report of his sermon), and his general character.

He says:

I will give you a little of my autobiography, and I am not ashamed of what God has wrought.

I was born in Edinburgh nearly 50 years ago.

Next May 25 I will be 50 years of age.

I earned my own bread from my 14th year, and was brought up in the academies of Edinburgh.

I went with my father, who is on this platform, to Australia.

I plunged into business, and within a few years was the resident partner's confidential clerk in a firm doing \$2,000,000 in open goods, every invoice of all these imports passing through my hands.

Soon after that I became the financial manager with a partnership interest, small then but larger to come, in another firm; and though I say it, I do not boast of it, I had the confidence before I was 21 years of age of men in the largest lines of business, and was myself handling large concerns.

At that age I consecrated myself to the ministry, and my money, hardly earned, and my time. With my father's co-operation I studied privately and then returned to my native city, Edinburgh, in the University of which I studied for some time.

I have the honor, therefore, of being a Scotchman trained in academical, in business, and in University life, and when I returned to Australia my brethen in the Congregational body within three short years gave me the honor of placing me at the head of possibly the most important charge in the entire denominational body—famous for its big heads, some people think, and, after all, there is something in those heads, too.

I was the pastor of the Newtown, Sydney, Congregational Church, which gave me the opportunity of ministering to the professors and students of Camden College, the only Theological Seminary of the Congregational Churches in Australia, which brought me into close touch with many of the ablest men in the great University of Sidney, a city of more than

half a million people. That was my third pastorate, and I held it when I laid down my denominational connection to give my life to a world-wide work for God and for humanity.

I had the honor of being at that time the leader—so Sir Alfred Stephens, the Lieutenant-Governor and Chief Justice for 29 years called me in a public meeting,—the leader of the Social Reform Party.

I was offered by Sir Henry Parks the portfolio of Minister of Education in his government, and I could have been, he said, Premier within a few years, if I had only given myself to politics.

I helped to mould public opinion, and helped to create legislation in my own land, and was frequently chosen to do important public work.

For instance, the Liberals of Sydney once appointed me, in company with Sir Henry Parks and the Editor of a Sydney daily paper, to draw up an important document addressed to the Right Hon. W. E. Gladstone. This document was one of great importance at a time when the foreign policy of the Tory party under Benjamin Disraeli, Earl of Beaconsfield, had strained the loyalty of Australia to the mother country.

On another occasion I was supported by the Protestant ministers of all denominations in Sydney in answering a famous address of Archbishop Roger Bede Vaughan, and when my address appeared in pamphlet form, it brought me kind commendation from the late Mark Pattison, Master of Lincoln College, Oxford, and from Mr. Gladstone himself. The largest hall in Sydney was filled to overflowing with the leading men of the land when this lecture was delivered, and it was the first gun fired in a battle against Roman Catholic supremacy in educational matters, the final result of which was the taking away of all grants to denominations from the public treasury and the establishment of a National Compulsory, and Free Educational System for all the people.

I am also the General Overseer of the Christian Catholic Church, which has tens of thousands of sympathizing friends in and around Chicago, and we have set down at our monthly Communion with nearly 2,000 communicants at one time in the auditorium.

I am the editor, proprietor, printer and publisher of "Leaves of Healing," a weekly paper with thousands of subscribers in all parts of the world, and God is blessing our little White Dove, of which we have no reason to be ashamed.

My position entitles me to courtesy, and the recognition of my ministry.

Beside Dr. Simpson and Dr. Dowie there are many local

leaders in this work whose methods differ slightly from those already mentioned. There is also a class of "travelling healers" who go about from place to place, each with his own claims to power, and with his own methods. Three of these may be mentioned, as the types and forerunners of what bids fair to become a distinct guild—that of the tramp healers. These are Schlatter, Schrader, and Bradley Newell. The first two, "Divine Healers," the last, "Magnetic."

Schrader and Newell are too well known through the daily press to need description here.

A brief biography of Schlatter will illustrate the type when sincere.

The career of Francis Schlatter is a most unique bit of biography. A native of Alsace, France, a shoemaker by trade, he came to America in 1884; spent some years in New York; went to Denver in 1892. In his youth he attended school until 14; but all his life he was a reader, student, and thinker. In 1893, at the age of 37, he became possessed of the idea that God—"Father" as he always familiarly called him,—wanted him to go forth from Denver on foot. He obeyed, and during the following two years walked through Colorado, Kansas, Indian Territory, Texas, New Mexico, Arizona, California, and back to New Mexico. On this journey he endured untold privations and hardships, from hunger, thirst, heat, cold, and unkind treatment. But he "had to" do it; and always obeyed "Father" at whatever cost. "Father" often told him to go without food for days at a time, and often allowed him water only on alternate days. He was imprisoned as insane at two different times. His own account of his wandering is interesting though somewhat monotonous reading.

He was well read on the great moral, religious, and social problems, and discussed them with a good deal of ability. He was possessed of the idea that he was Christ, and explicitly declared it on a few occasions; though as a general thing he talked and acted without any apparent idea of such an impersonation. Only his appearance, dress, hair, etc., were strikingly suggestive of the mediæval pictures of Christ.

His discussions were strongly marked by two ideas—reincarnation, and socialism.

Whatever conclusion one reaches as to his real nature and condition, no one can doubt the sincerity of the man. He honestly thought himself called to do a great work for "Father," and he devoted himself to it with all his energy, and with that childlike faith which produced surprising results. One can but regret that his ideas only led to his untimely death.

Following these, as another species of mental therapeutics, we may mention hypnotism. The treatment of disease by

hypnotism is avowedly a matter of suggestion. While extensive in its use and application, it is yet confessedly limited. Practiced by a large number of regular physicians, some of them of world-wide reputation, the cases number many thousands and constitute some of the most valuable sort of data. We shall revert to this more at length later.

The following account taken from Bernheim (*Suggestive Therapeutics*, p. 363,) will illustrate his method :

M., 27. Married, delicate constitution, nervous temperament, suffering from severe intercapular pain. Pressure in the region causes severe pain. I propose to hypnotize him by closing the eyes. He gives himself up to it with a bad grace. He is very impressionable and fears that I wish to perform an operation on him. I reassure him, and continue *suggestion*, holding his eyes closed. His nervous anxiety is with difficulty dissipated. His hands tremble. However, he goes into *profound sleep*; there is relaxation without catalepsy, and no memory upon waking. I energetically suggest calmness of mind; I affirm that the pain has disappeared.

Having let him sleep alone for about six minutes, he has several nervous spasms and calls out: "I am falling!" and then awakens as if coming out of a nightmare. He remembers having dreamed that he was falling into a ditch. *The pain has almost completely disappeared*; he is surprised; cannot find the sore spots. *I hypnotize him a second time*. He gives himself up easily. His sleep is more quiet; there are slight nervous movements in his hands. I suggest the complete disappearance of the pain. Upon waking he remembers having heard talking but does not know what I said. . . . There is not the slightest pain. He does not understand it; his astonishment has something comical about it.

Such is Bernheim's own account, slightly abridged, of one case. Of course it must be understood, that, as in regular practice, no two cases are treated just alike.

Besides these four distinct schools of curing disease without drugs, there are many minor forms in which the same element is to be seen, though not usually so considered. Among these may be mentioned Patent Medicines in so far as they cure "incurable diseases" or produce results out of proportion to the known therapeutic value of the drugs constituting the compound. Especially is this seen in the great number of patent "devices" for the cure of disease, such as "electric" belts, bandages and garments of all sorts, also the various inhalers.

A striking device, remarkable for the cures it has wrought, as well as for the absolute freedom from anything curative except its name, might be designated as a string one end of which is fastened to the ankle of the patient, while the other end is tied to a tin can which is then immersed in a dish of water or buried in the ground. Again we have no end of "health fads," each producing its long list of testimonials, in the shape of cures of more or less serious diseases, but which again reduce in the last analysis, to the effect of the mind of the patient

upon his own body. "Home remedies" also contain many instances of the same thing, and they in turn are the survivals in the present time of the older customs which characterized the age when nearly all therapeutics was a science of magic.

In the study, of which the present paper presents a portion, all of these phases have been investigated extensively. Folklore literature has been ransacked for all that it could furnish in regard to practices, superstitious and otherwise, relating to therapeutics. The "fads" of modern times have been collected; the household remedies still in vogue have added their testimony; patent medicines and devices have been examined as to their actual medicinal value, and the results they produce. Their testimonials have been examined and verified.

We have studied with the hypnotist, seen him at work and learned his art. Hundreds of cases treated by hypnotism have been studied and tabulated. The divine healer has been observed in many instances and particularly in the persons of Schrader, whose blessing we received on two occasions, and Dowie, whose work we visited and whose method we studied in his "Divine healing home" in Chicago.

As a basis for study of Divine Healing, we have over 1,600 records of individual cures, all of more or less value and completeness.

The cases to be discussed are nearly all from Dr. Dowie's work. About two-thirds of them are females. In age they range from 6 mos. to 86 yrs. though the main part of them are between 20 and 50. Of the women, the married are about three times as numerous as the unmarried.

The duration of the disease from which they were healed, varies from a few minutes to fifty-two years. The average time is about twelve years for each sex. Thirty-three per cent. report their healing instantaneous, fifty per cent. gradual and seventeen per cent. say they are not yet perfectly healed. It must be noted that while thirty-three per cent. report instantaneous healing, it is clear from their own account that they almost always mean that pain ceased instantly. And it may be mentioned here that of all the returns that give data on that point, almost every one shows that pain ceased at the time of prayer.

Again, of the whole number seventy-six per cent. were treated, or prayed with, by Dr. Dowie in person, seven and one-half per cent. were prayed for by him at a distance. Four and one-half per cent. were prayed for by Mrs. Dowie. Seven and one-half per cent. were healed in answer to *their own* prayers or efforts and four and one-half per cent. were healed in answer to prayers of friends.

The number of ailments mentioned in their accounts of

themselves, varies from 1 to 9 for the males, and 1 to 11 for the females.

The time that has elapsed since the cure varies from a few days to fourteen years. Time required for full recovery may be as much as two months. If longer than that it seems to be regarded as a failure and is not mentioned.

As to diseases cured they have been classified roughly as follows: the figures are per cents.

## DISEASES.

	Nervous.	Circulation.	Respiration.	Digest.	Contagious.	Wounds.	Cancer.	Rheumatism.
Males. 20	10	20	15	5	14	5	11	
Females. 22	14.5	18	16	5	3.5	11.5	9.5	

Among the remarkable features mentioned may be noted the following: Legs lengthened from 1 to 5 inches. "Gained 95 lbs." Hip  $2\frac{1}{2}$  inches reduced. 56 abscesses at one time, cured. Deaf and dumb. Senseless 3 weeks. While the men report: "40 whiskies a day," cured. "Wreck physically." Hip disease. Goitre. 3 Bullets. Deaf and dumb. Fever settled in bones. Appendicitis. Leg shortened 2 inches. Born blind. Deaf after measles.

These were jotted down as the reports were read, simply as an indication of the range of the work. In the reports of women the term "Internal troubles" is often mentioned. From the context it appears that the expression generally refers to troubles peculiar to that sex. In other cases such troubles are directly specified.

The following is a list of the "Troubles" as stated by the patients themselves:

Abscess; accident; ague; appendicitis; ankle sprained; asthma; backache; back weak; bad habits; bilious trouble; blindness; blind from birth; blood poisoning; Bright's disease; bronchitis; bronchial disease; broken arm; burns; burnt hands; blood disease; brain fever; cancer; cancer in tongue; cancerous tumor; carbuncle; catarrh; chills; cholera infantum; cholera morbus; congestion of lungs; consumption; constipation; convulsions; cough; chlorosis; compound curvature of spine; croup; deafness; deaf and dumb; diabetes; diarrhoea; diphtheria; dislocated shoulder; dislocated knee; dropsy; dysentery; dyspepsia; diphtheretic paralysis; devil cast out; earache; eczema; epilepsy; erysipelas; eyes, inflammation of; eyes, weak; eyes, sight failing; feeble minded child; fever; fever sores; felon; fistula; gangrene; gambling; goitre; granulated eyelids; gall stone; headache; healed when dying; heart disease; heart broken; heel lame; hay fever; hydatids; hydrophobia; hemorrhage of lungs; hemorrhage of kidneys; hemorrhoids; her-

nia; hip broken; hip disease; hip joint renewed; hysteria; imperfect sight; infidelity; impediment of speech; impotent; indigestion; inflammation of bowels; inflammation of stomach; inflammation of lungs; inflammatory rheumatism; internal tumor; ivy poison; internal troubles; intestinal trouble; insanity; kidney and bladder; knee, injured; knee, stiff; knee, swelling in; la grippe; lame; leg too long; leg too short; leg, poisoned; leucæmia; liver trouble; locomotor ataxia; lung trouble; lung fever; lumbago; malaria; measles; meningitis; morphine habit; mumps; nearsightedness; nervous exhaustion; nervous prostration; nervous trouble; neuralgia; nervous debility; ovarian tumor; palsy; paralysis; periostitis; piles; pneumonia; poly-pus; puerperal convulsions; peritonitis; pleurisy; paralysis of bowels; palpitation of heart; quinsy; rheumatism; running sore; rib broken; rupture; salt rheum; scalding; scarlet fever; scrofula; skin eruption; skull fractures; sick headache; spasms; sea sickness; sleeplessness; small pox; spinal meningitis; sore throat; spinal disease; spine, curvature of; sciatica; stone cancer; stigmatism; stiff hip joint; stomach trouble; sunstroke; synovitis; symmetrical keratiasis of the palms and soles; tape-worm; throat trouble; tobacco; toothache; tonsilitis; tuberculosis; telegrapher's paralysis; tuberculosis of bowels; tumor; tumor fibroid; thigh bone diseased; typhoid fever; ulcers; urinary trouble; ulcers in bowels; varicose ulcer; varicose veins; whiskey; wounds; wrist sprained; weak lungs; weak eyes; white diphtheria; wild hairs; whooping cough; yellow fever.

The unfortunate Schlatter has been followed, by his own written testimony, and that of his personal friends, through his work as a healer and his wanderings alone until his death from starvation in the deserts of the Southwest, a victim to a peculiar form of delusional insanity manifesting itself in religiomania.

Cures at shrines such as Lourdes, and by means of sacred relics have contributed their lessons.

Christian Science has unwillingly yielded its facts and philosophy to our work. By means of many personal interviews with Christian Science healers, people who had been healed and those upon whom the method had failed, and by a faithful perusal of "Science and Health," together with a careful study of the life of Mrs. Eddy from childhood, a clear view of the whole system has been obtained. A study of cases similar to those under divine healing has also been made.

Lastly, Mental Science has received its share of attention and yielded perhaps the best returns. Mental Science healers have been uniformly courteous and helpful, ready to furnish records of their cures and often of their failures, willing to



discuss their theories and admit their limitations. The literature of this as well as of the other schools has been read.

The result of this investigation, extending over more than two years, is an absolute conviction based upon evidence, only one or two items of which we can give here, that the curative principle in every one of the forms is found in the influence of the mind of the patient on his body. In other words, however different the claims and the method, the explanation of all is the same. We may mention a few of the items leading to this conclusion. They all cure disease and they all have failures. They all cure the same kind of diseases and the same diseases are incurable for them all. In those classes of disease where the cures are wrought, there are the same percentages of cures by all the methods. Stripped from a few characteristic phrases all the reports from all the different forms are identical. A testimonial to a patent medicine, for example, reads precisely like one of Dowie's reports of a divine healing cure. Again there are many records of people going from one school to another and in this no one practice seems to show any advantage. Some fail after trying all. Some fail to get cured by divine healing, but get restored by Christian Science, and *vice versa*. Others fail with Christian Science and are successful in hypnotism, and *vice versa*.

In view of this unity of principle, we have selected for special presentation here, the two forms of Mental Science and Hypnotism as typical of the whole matter. Mental Science gives the best expression of the popular philosophy in this line, while Hypnotism gives the scientist's view of the same thing. On the popular side, Mental Science is free from the dogmatism of the Christian Scientist, and the superstition of the divine healer. The cases are the most fully reported, and the arguments of the advocates are most intelligible.

As previously stated Mental Science originated with Dr. Quimby, and we may now give a short sketch of his life and philosophy, to be followed by a brief account of the later developments of the movement and lastly by the data of the cures wrought by it.

Phineas Parkhurst Quimby was born in Lebanon, N. H., Feb. 16, 1802. While still a child his parents moved to Belfast, Maine, where he thereafter always lived, although he had an office in Portland the latter years of his life.

He had, perhaps, the average education of a boy in a small town, in those days. It was meagre as to actual book study, but evidently full of that suggestiveness which led him always to long for more. He had an inventive mind, being interested in mechanics, philosophy, and scientific subjects.

When about 36 years of age, a travelling hypnotist, elicited

his intense interest. "At that time, Mr. Quimby was of medium height, small of stature; quick-motined and nervous, with piercing black eyes, black hair and whiskers; a well-shaped, well-balanced head; high, broad forehead, and a rather prominent nose, and a mouth indicating strength and firmness of will; persistent in what he undertook, and not easily defeated or discouraged." (New England Mag., Mar., 1888.)

He began at once to experiment, trying to hypnotize any one who would submit to the experiment. He soon found that he had some success and finally discovered a subject whom he could influence in a remarkable degree. With this subject he gave exhibitions for several years, travelling through Maine and New Brunswick.

He produced hypnosis, by sitting in front of his subject and looking him in the eye for a few moments. The performances were so remarkable that others began to investigate the matter, and Mr. Quimby was called upon to use the powers of his subject to diagnose disease. Mr. Quimby soon noticed that the diagnosis was always identical with what the patient himself, or some one else in the room, thought was the trouble.

This gave him his first suggestion of the connection between mesmerism and the cure of disease. From this time on he devoted himself to the study of what he considered the greatest boon to mankind, that had ever been discovered—the cause and cure of disease by mental states.

He soon found that the hypnotic state was unnecessary to the success of his work, and accordingly dropped that part of his practice, either because it was a bothersome and useless adjunct to his work of healing, or, as seems more likely, because in those days, mesmerism, especially when used in connection with the health of any one, was generally regarded as witchcraft, or some form of spiritism, and this brought his great discovery into undeserved disrepute.

Therefore, instead of going through the forms and ceremonies usually accompanying hypnotization, he simply sat by the side of his patient, talked with him about his disease, explained his own theory, convinced him that his disease was an error and "established the truth in its place, which, if done, was the cure." He sometimes, in cases of lameness and sprains, manipulated the limbs of the patient, and often rubbed the head of the patient with his hands, wetting them with water. He said it was so hard for the patient to believe that his mere talk with him produced the cure, that he did his rubbing simply that the patient would have more confidence in him; but he always insisted that he possessed no "power" nor healing properties different from any one else and that his manipulations

produced no beneficial effect upon the patient, although it was often the case that the patient himself thought they did.

Mr. Quimby's practice increased rapidly. In 1859, he made his headquarters at Portland though his home was still in Belfast. In Portland he became favorably known and treated many patients and performed some remarkable cures, as described in the papers at that period.

In 1866, Dr. Quimby was overcome by the pressure of work, which his unselfish devotion to humanity as he regarded it, forbade him to neglect, and he passed away at his home in Belfast, Me.

While he was undoubtedly hampered by some superstitions, for which the age was more responsible than he, and which his successors have in part perpetuated and increased, and in part outgrown; yet to him, undoubtedly, belongs the credit not of discovering that mind influences matter, nor yet of originating the philosopheme that all matter is the creation of mind, but rather of practically applying the principles to the prevention and cure of disease.

Whatever may be the future of mental healing, it must at least take its place as a valuable addition to our methods of coping with human infirmities.

A few quotations from Dr. Quimby's writings will show his point of view—his philosophy.

He says of his method: "I give no medicines; I simply sit by the patient's side and explain to him what he thinks is his disease, and my explanation is the cure. And, if I succeed in correcting his errors, I change the fluids of the system and establish the truth, or health. The truth is the cure."

"When I mesmerized my subject he would prescribe some little simple herb that would do no harm or good of itself. In some cases this would cure the patient. I also found that any medicine would cure certain cases, if he ordered it. This led me to investigate the matter and arrive at the stand I now take: that the cure is not in the medicine, but in the confidence of the doctor or medium."

"Now I deny disease as a truth, but admit it as a deception, started like all other stories without any foundation, and handed down from generation to generation till the people believe it, and it becomes a part of their lives. So they live a lie, and their senses are in it.

"To illustrate this, suppose I tell a person he has the diphtheria; and he is perfectly ignorant of what I mean. So I describe the feelings and tell the danger of the disease, and how fatal it is in many places. This makes the person nervous, and I finally convince him of the disease. I have now made one; and he attaches himself to it, and really understands it,

and he is in it body and soul. Now he goes to work to make it, and in a short time it makes its appearance.

"My way of curing convinces him that he has been deceived ; and if I succeed, the patient is cured. (1862)

"Man in his natural state was no more liable to disease than the beast, but as soon as he began to reason, he became diseased; his disease was in his reason."

Mental Science varies so much among the individual healers and leaders that it is impossible to characterize it under one head. One fairly representative statement is the following from an editor of one of the numerous journals devoted to this movement. He says that the movement is founded on the discovery that, "Mind is the only power; that this is God's world, and that all the people are his beloved children. The horrible, God-dishonoring dogma of hell and perdition crumbles and passes into nothingness before the marvellous light of Love. The angry, vengeful, jealous God who cursed the world for so many years—blighting hope, chilling love, scaring innocence and emasculating divine manhood—now veils his distorted features, and takes refuge in the dingy precincts of a few unenlightened orthodox churches. The God of Love, the All-good Father, now reigns supreme."

Such is their theology. Their healing practice grows out of that, and varies in its claims according to the nature of the healer—whether he looks to the theoretical side, the theological; or to the practical, the empirical. Some claim everything; others claim little more than the most enlightened and broad minded medical men admit.

The following quotations from a recent pamphlet (Christian Science and the New Metaphysical Movement, published by the Metaphysical Club, Boston,) emphasizes still further the differences between Eddyism, and Mental Science.

"Christian Science proclaims the unreality of matter and of the body. The rational and broader thought, not only admits the validity of the body, as veritable expression, but claims that it is as good in its own place and plane, as is the soul or spirit. While susceptible to mental moulding, it is neither an error nor an illusion. . . . It is to be ruled, beautified, and utilized in its own order, and not denied an existence. Even admitting that the whole cosmos is in the last analysis, but one Universal Mind and its manifestation even admitting that all matter is but a lower vibration of spirit, and that the human body is essentially a mental rather than a physical organism; still matter has its own relative reality and validity, and is not to be ignored as illusion."

The broader view "utilizes a practical idealism. It is entirely optimistic . . . understanding, both from ex-

perience and observation that a systematic employment of mental potency in a rational, scientific, and idealistic manner has a wonderful and unappreciated healing energy. . . . It does not antagonize common sense nor sound philosophy. While thoroughly loyal to principle, and the higher causation, and to an uncompromising spiritual philosophy, it recognizes that progress must be evolutionary. It does not ignore the good in existing systems, disparage reasonable hygiene, or deny the place of certain departments of surgery. It is not insensible to the present and provisional uses of simple external therapeutic agencies. . . ."

Mental Science is far more "scientific" than Christian Science in that it is free from the dogmatism, and seeks for a broad and general principle upon which to base its results. Being free from the domination of any one mind claiming infallibility, and without any organization, there is a much greater diversity in the theories and in the practices of the different healers. There is also a far greater readiness to accept the facts and to be governed by them, to consider the views of others, and to accept such as seem well founded. It must be remembered, however, that while this is true of the Mental Scientists as a whole, there are those who hold the extreme view that the "science" is fully established, is perfect in its theory and absolutely invariable in its results, and of universal application. At the other end are those who emphasize the empirical side. They have seen results, they know the method is sure under certain circumstances. They confess it is not in all cases, and whether it can be made so or not, they are in doubt. They use it for what good they can get out of it, and hope that time and experience will make clear the true limits or the limitlessness of the application.

These varying attitudes are extremely valuable to the student, and are worth presenting. They are well shown in the following extracts from personal letters received from prominent persons in this line.

Each letter is given entire and in the words of the writer, except that changes are made in names and dates, etc., in order to prevent recognition and so save the writer from any unpleasant notoriety.

#### CONDENSED PERSONAL OUTLINE—MENTAL SCIENCE.

M., 64. English descent. Sensitive, delicate organization; very conscientious; strongly intuitive; very imaginative; fairly intellectual. Subject to "ups and downs;" dominated considerably by conscious and unconscious fears and forebodings, which I now know were largely caused by early theological training. Academic education. In business inclined to overexertion. Intense business care and responsibility developed nervous weakness. Fears and forebodings prominent enough to cause mental disquietude. Alternations of de-

pression became pronounced. Fears began to take new forms. Every danger was magnified. Health broke and was obliged to quit business.

All this time was under best medical treatment, and observed hygienic rules. No permanent improvement, but managed to keep about the most of the time. Insomnia, dyspepsia, pain at base of brain, with a variety of kindred ills. Entire lack of nerve. Consulted famous physicians. No improvement. Acute attacks of tonsilitis, colds and fevers. Morbid impulses, hard to resist.

Persuaded to try mental healing. I had tried everything else, and was desperate, had but little faith. First healer made no impression. After month went to another. No change for two weeks, and then with sharp transitions for an occasional half hour or so, in a day, an interval of perfect mental and physical harmony. Great revelation. Had had nothing like it for years. New hope! But each time I dropped back, seemed as bad as ever. But slowly the harmonious seasons lengthened and became a little more frequent. Began to watch my own mental processes and sequences, and interested myself in the literature of the subject and the experiences of others. Gained gradual command. Old and new thought in conflict within, plainly felt and thoroughly diagnosed. Took some treatments off and on for two years, but growingly, the greater normality of self-healing dawned upon me. Increasingly learned to vanquish discordant and depressing thoughts. The beauty and immense importance of this principle of this practical idealism seemed to me a discovery—a truth beyond value. I intuitively became thoroughly idealistic and optimistic. I realized that the whole world is suffering, exactly as I had done, though in a less degree. Knowledge of the creative power of thought stood before me as the one great truth needed to cure the woes of the world. But the supernaturalism of the church and the materialism of science made and still make both hostile to such a philosophy. A feeling of at-one-ment with the Universal Goodness, may be systematically cultivated and may be depended upon to displace all opposites. I became convinced that these things are law, as exact as any law of physics or chemistry. Other experiences abundantly confirmed my own.

For six years past I have taken no medicine, and not been confined to my room for an hour. Temporarily, sometimes some of the old scars or slight remnants of old chronic conditions appear, but they give me no apprehension, and under the law are easily vanquished. I have more solid enjoyment now in one year, than in the thirty years from the time I was 20 until I was 50. The "Spirit of Truth" is a natural, lawful, and veritable teacher. The importance to the world of the harnessing of electrical forces, is infantile and puny, compared with the intelligent utilization of the power of thinking according to law.

F., 35.

DEAR SIR :

. . . . . my airy disposition and sanguine temperament finds mental analysis and descriptive retrospection very irksome.

Two years ago I was first interested on my own account in Mental Healing. . . . . In receiving both absent and present silent treatment (after I believed in the possibility of another's thought affecting me, if they willed it and I set up no barrier) I was conscious of thrills running up and down the body. The first treatments before I believed, made no conscious impression on the body, but I was restored to my normal buoyancy of spirit. The bodily ache did not begin to yield until five or six months afterward, when I began to try to help myself by saying and trying to feel that I loved everybody. I had for years



been deeply resentful toward one person and considered my final nervous breakdown three years ago (six months duration) much aggravated by the physician employed. As I gained control over my resentment through Auto-Suggestion and help from the healer I began to lose the physical ache. . . . Had no school training in psychology, nor church training which satisfied anything higher than my sense of the æsthetic.

Have left the Episcopal Church, as no creeds satisfy me. I worship God by cultivating the fruits of the Spirit and by daily aspiration towards "whatsoever things are true, honest, just, pure, lovely, and of good report." . . . The first intimation of the power of thought over the body was given me by a German physician whose prescriptions of iron and mineral water did no permanent good. One day after observing me closely, he said "guard your thoughts Fraulein." . . . It has taken eight years for that seed to fructify. I could never forget that sentence. After I broke down, in my 33rd year, and began to pull up, I was recommended to read some of the best works on this subject.

These settled my belief that one can become physically, mentally, morally, what they sincerely desire and will to. Intense desire and concentrated thought will draw out of the invisible into the visible . . . In music (I spent eight hard, weary years in Leipzig), in oratory, in psycho-physical culture, the highest, noblest, purest, has been drawn to me through the law of vibration. . . .

As for education, I was in and out of dozens of boarding schools, from life in British Guiana, Ireland, France, and New England, until twenty-one years of age; a foe to book knowledge, and a lover of running, dancing, swinging—anything that necessitated air.

This has been explained since reading zodiacal books—as I was born on the cusp between Gemini and Cancer, my earth sign being Sagittarius. Science, art, and spiritual development, are all that life holds for me. Facts, reason, judgment, do not attract me.

Sincerely yours,

F., 28. Nervous prostration, showing itself through physical exhaustion, lack of sleep, tears, and suppressed menstruation. Physically, had always been strong, but the other symptoms had always been noticeable from previous life since twelve years of age. Much nervousness on maternal side of family, with insanity showing itself in several members of second generation before me. Had taught for eight or nine years previous to illness, with great pleasure though it was largely a necessity. Temperament, great self-consciousness; great lack of trusting to the interior self for action; always planning what was to be done, no spontaneity or demonstration of the affections. Consequently, great contraction throughout the organism. Conscientious, thorough, and energetic. No interior consciousness as a fundamental support. Always went to a liberal Unitarian Church but had no home religious instruction and only for a short period at church. Religion was external, intellectual. My whole life wholly of the head, very little of the heart, almost none consciously of the soul. This last I consider the true cause of my illness.

Made no improvement under a prominent M. D. Grew distinctly worse at sanitarium, then returned home under care of an M. D. Grew very much better, but did not overcome symptoms, except tendency to tears.

At desire of an intimate friend went to Mrs. A. for mental treatment after nine months with the M. D.

Went to Mrs. A. in October. Improved; apparently recovered. In January following, felt less strong, returned to her, but apparently



received no help. Had no consciousness of incoming life, as had had at early treatments. Knowing no other resource went to my former M. D. again, and was then sicker than ever before, and more nearly on the verge of insanity. I believe if any one vibrates between medicine and mental healing, there is no permanent cure for them and they are likely to have an aggravated form of their former illness.

Next went to Miss B., Mental Healer, who had brought back to health a friend who had had a long illness like my own. The contrast between the result of this treatment and that from Mrs. A. lies in the fact that I went now from my own volition, feeling that this was my last chance; also I felt a greater affinity for Miss B. The treatments were more immediate and more marked in their interior effects. I did not make great physical gains, but my whole interior nature was shaken to its core. The physical effect was to make me sleepy, and to want to keep quiet and to want to read the Bible, which I had never cared for. The treatments were daily, half an hour long, with my hand in hers and in a relaxed position, so that I could rest or sleep afterwards. She gave no directions except to rest afterwards, and take more interest in what was going on about me, and break up old habits. Very soon I began to have a desire to lead a more religious life; then to see that all life was in mind, surging up into consciousness of my faults.

Since that time I have taken no medicine nor been under a doctor's care. Later, felt that Miss B.'s treatments were too stimulating, though really encouraging in power and value. To rest from such intensity of mental and spiritual action as it produced, I went South. Here I had treatment from Christian Science. Was always conscious of these absent treatments. It was as if a current of electricity was coming into and suffusing me. It was the same with Miss B.'s treatments except that Miss B.'s were more powerful.

Felt an inward charge to give up the treatments. By this time neuralgia had left me and I had resumed the habits of normal life. An imperfect digestion is all that remained of the old illness. For seven years have been able to care for myself by this thought method.

Was educated in public schools; fitted for Harvard. Taught.

All is God. All is good, in the fact that all is perpetual evolution under Divine law. We reap the fruits of our own sowing. Doctrine of reincarnation seems to me probable.

F. 47. American. I inherit a nervous temperament. I can never remember the time when I was well and free from pain; still I worked, teaching for several years, afterwards dressmaking, between long intervals of severe sickness. When 37, was told I had a tumor and its removal was necessary. Accordingly I was sent to hospital and ovariectomy was performed. Tubercles were also found and removed. My bowels were kept open two years and kept clean by means of inserted perforated tubes. Then they were allowed to heal. This was considered a very wonderful piece of surgery. But my courage was marvellous, for I was buoyed up by the hope of being perfectly well. But six years later another operation for fibroid tumor left me with no hope of recovery. Spinal neuralgia, intestinal indigestion, and worse than all, a brain incapable of any mental effort, all of which left me in a deplorable condition. Was refused admission to the hospitals because case too chronic. Two years ago was admitted to a mental healing home. While there, was constantly haunted by the fear that I should be dismissed as incurable. The treatments were mostly silent, and I seemed to be groping in the dark unable to grasp the truth. After four months treatment I was told that I had sufficient knowledge of the new philosophy to heal myself, and I came away with the feel-

ing that I was sent because incurable. Still there was a start in the right direction that was the beginning of a new life.

Then came a year of severe struggle alone. I had been reading a book on the subject, and tried to follow its directions as best I could. But my mind was so bewildered that it was incapable of reception. I received some help. Still doubts, fears, vacillation, impatience and worry had their effect, and the progress was slow.

Nearly a year ago, I received a copy of a Mental Science Journal. I wrote to the editor. She inspired me with hope. I believed she could help me and I began to take treatments. She taught me how to relax every nerve and muscle and to lean lovingly on her and to *expect* a realization of my desires. The treatments have been wholly absent, for I have never seen her, but their effect upon me has been marvellous.

A fixed time each day was given to the treatments, and the time strictly adhered to. The first requirement was relaxation, the second trust. In leaning upon her in this relaxed condition, I learned to lean upon the ALL WITHIN myself. The progress was slow (but there was a life time of weakness to overcome) but the improvement was noticeable from the very first treatment.

Two strong evidences of cure are: increased physical endurance and greater mental power. Yet while I am conscious of greater strength and clearer perception, I cannot conceive the time in any person's life when there would be nothing to overcome; and I find it just as necessary to hold myself receptive to the teachings of the Great Soul as at first. And of course I lean more and more upon *Its* guidance. Denials have little weight with me. My strength is in affirmations. While I think that health is after all, a secondary consideration, I know it *must* follow from right thinking and right living. Love fulfills the whole law of life. All things can be accomplished through this mighty force. Even death must yield to its power.

My reading on the subject has been limited, partly from choice, partly from necessity. Another's opinion cannot be mine. I listen to the Kingdom of the All Within me for the wisdom that never fails. This is the most essential thing I have learned in Mental Science, and this has the greatest influence upon my life.

There are millions and millions of forces awaiting our recognition and if we hold ourselves receptive to this Truth, there is no limit to our growth. I should say to all "Read less, *think* and *practice more*."

Sincerely,

DEAR SIR: Three years ago I was quite ill from nervous prostration, and a tendency to fall when I attempted to walk, and I also suffered from an abnormal action of the heart, and other effects of an exhausted nervous system. For a number of years I had been unable to sleep without quieting mixtures of some sort, and stronger ones were resorted to as the nervous system became weakened, and insomnia got the better of me.

As a result of these physical conditions, my mental condition was deplorable—or that is what I believed at that time. I had no hope, and was burdened day and night with the idea of continuing to be a burden to myself and to my friends. Naturally I am not despondent, but nervous exhaustion being considered hereditary in my family, and my physicians giving me little encouragement, I saw no way to regain health.

I thought because I was over 50 years of age, that I was less likely to recover than a younger person under similar conditions. I did not worry about business affairs, as I have no business occupation. I am an American with liberal views regarding religion, always having

believed in the fatherhood of God and the brotherhood of man; no church creed being so broad as my own inner perception of God and of duty, consequently I am connected with no church.

When health failed and faith in medicine was lost, I resorted as a forlorn hope to mental treatment. I was received as a patient by a mental healer. I remained there twelve weeks. The method was verbal suggestion and silent treatment. I can report no special feeling I experienced during treatment, only I hoped I would receive help.

And I did receive it. After a few weeks I was able to sleep well, and I took up life again with courage and purpose. I have continued to improve slowly but surely. The verbal instructions I received have enabled me to care for myself since leaving the home.

I think there was nothing in my school education that bore especially on the subject of spiritual science. I was educated in the common schools of my native town of ———, ———. I never studied psychology. I have read some philosophy, and much fiction.

I think that a study in this line, wisely selected and properly expounded, would, if introduced into the schools, be of inestimable value.

Very truly yours,

F., 47. Neurasthenia, brought on by exclusive and highly unwise devotion to study outside of school hours, as a preparation for teaching; from worry; from the absence of all modes of expression except through teaching; withdrawal from the society of my friends; and from insufficient motor activity of any sort.

My trouble lasted about six months before I undertook mental treatment, which lasted three weeks. The only feeling I had was hope or desire that I might be relieved of the awful sense of burden that my school work laid upon me. I was not conscious that I was improving at the time. But I gained an increasing sense of the significance of certain passages of the Bible. I then went to the seashore, where I became conscious that I was really much better. The cure has been permanent. That is, I have not since had nervous trouble, and my general health is fairly good. An evidence of cure is that I do not live in fear that the disease may return.

I am not so convinced that mental healing is capable of curing any disease that I should have recourse to it in all cases. I have, since my recovery, had a physician in my family.

As to school, I am convinced that the soul of the child needs more recognition than it gets in the schoolroom; and that it must be nourished there as it is not now nourished. Nature lessons from the right point of view—revealing the inter-dependence of forms of life, and poetry wisely selected and taught by a truly sympathetic teacher, will do much to lift the child upon a higher spiritual plane.

(University education)

Sincerely,

I was a constant sufferer for fourteen years and treated by a dozen physicians; ovarian tumor which was increasing in size, and with no hope except by a severe operation, and really no hope then, since the complications made it almost suicidal to put myself into the hands of the surgeon.

I had begun teaching at 16, and at 24 was a total wreck. I was under treatment by Mental Science eight months, then returned home cured. Undertook the care of the sick, immediately, and for eleven weeks did not get an unbroken night's rest.

Absent treatments were beneficial, but not as satisfactory as the "present." I knew the time that I was to receive them.

In some respects I noticed improvement in a few days, but had se-

vere struggles with intense pain and at one time was very low for a number of hours. Each time I went down came up stronger than before.

Have been well for eight years. My disposition is very much changed, and is very noticeable to my near relatives.

Educated in girls' boarding school, have read much history and good novels.

F. I was a natural student, educated in public schools of Maine, followed by two years at Mt. Holyoke Seminary, where in trying to crowd four years into three, and being in a state of anxious fear, slight deafness appeared, heat in head and throat and catarrhal condition, later, of whole mucous membrane. Many physicians, but only temporary relief. Two mental shocks from sudden death produced almost paralysis. Tried Mind Cure. Slowly I was led to believe that every state of mind effected the body expanding and contracting it, and to cure, the mental state had to be corrected. Improvement began at once; but it was more than a year before I was thoroughly convinced of the mental cause of disease and my own body well renovated, and still the deafness was not wholly overcome.

My cure came by being educated or growing into their way of thinking. Since then we have never used drugs in our family. There has been no return of old troubles. Some failures followed the efforts of these healers.

M., 77. Nervous. Congregationalist. American. Mercantile life. Disease hereditary. Eczema, began at age of 65. Treated by prominent physicians. Two months without medicine, then Mental Science. Absent treatment not satisfactory. Treated two months, then treated self.

Began to improve in two weeks, slowly but without relapses. Cure complete in three months. Cured two years three months. No return of eczema. Tumor all gone, also hernia and kidney trouble.

Belief in the science has changed my whole course of life, leading my mind to more spiritual thought, quieting my nervous temperament, more free from envy, hate, quick temper, and more free from anxiety. Think basic principles should be introduced into our schools at once. I never studied psychology, left school at 15.

Yours truly,

Temperament, nervous, sanguine; age about 45. American; occupation, piano-forte teaching; religion, liberal thought.

Hereditary headaches and weak digestion, then after the birth of one child, at 38, and subsequent hospital operation for laceration of the cervix, there was a gradual break down, until scarcely any organ of the body was in a normal condition.

Think now that most of it was fear and worry. Had at different times been under the care of 22 different doctors. Amongst them [names six prominent physicians of New York and Boston] and other local physicians. There was a morbid terror of cancers, and an inability to eat any food without fearing sick headache, which was frequently of 48 hours' duration and sometimes occurred three times a week. Treatment was given by [a mental healer] of Boston, by silent suggestion, and was immediately helpful. I had no faith in the treatment at the time, and was a disbeliever in the power of faith. For three years I have enjoyed the best of health and expect to so continue. The effects of the teachings absorbed have been most beneficial in changing my whole disposition. I no longer worry, can keep my temper, and am growing more patient. Therein, I firmly believe, lies the whole cure, and the "failures" of which I know many, are all

traceable to the wish to be healed without being willing to change the thoughts. I think I might write of fifty cases personally known to me, where recovery has been complete and lasting.

Nothing in my school education bore at all on this subject. Never read a work on psychology until three years ago. Was educated at a private school, since discontinued, in ———. Fitted for college at 16, but was debarred from entering at that time by the old ideas forbidding a woman to share education with her brothers. Have read almost everything appertaining to psychology during the last few years. Its effect is marvellous. It opens the gateway to health, happiness, serenity, advancement, both spiritual and temporal; develops the intellect, abolishes fear and worry, alters our old ideas of Divinity, and gives us more than a glimpse into a future state of existence.

F. 41. American. Unitarian.

Disease of spinal cord (lateral sclerosis). Given up by hospital authorities, as not likely ever to walk again. The disease accompanied nervous prostration, brought on by overwork in teaching.

Greatly depressed: mind dwelling on weak state and wholly ruled by bodily sensations. Learned Mental Science and improvement began at once. Attitude of mind entirely changed. From dwelling on weakness, and illness, my mind was turned toward health with full expectation of regaining it.

Found great help in the mental atmosphere of those about me, every one believing in my recovery. Left my healer after about four months. Since then—winter of 1894—my general health has been excellent, though I have not yet regained entire independence in walking. Use a cane. No result from absent treatment, though I tried to co-operate with the healer. There was a regular appointment as to time of these absent treatments. Modern languages and psychology studied.

The following personal letter is from a prominent scholar, who has taught in both English and American Universities and is a recognized authority in his department.

I can only say that when Miss ——— came to stay with us, my eyes were in a very bad state. They were inflamed and the lids granulated. I could hardly manage my daily work, to say nothing of MSS. and the like. I was wearing spectacles, as I had done for years, on account of a malformation in the left eye.

Under Miss ———'s treatment my eyes got well like magic; I gave up the glasses, and in a few days was all right; and for two years, if I remember rightly, I did not use the glasses again.

Possibly you might say that discarding the glasses operated beneficially. I can think of no other explanation that is not a psychic one. And I may say, for myself, I am satisfied with the psychic explanation.

I find my eyesight at present is growing weaker, especially the left eye, and I doubt whether I shall do much more difficult decipherment. Still there is not much amiss, and I think I still retain the evidence of Miss ———'s beneficial treatment.

Sincerely, ———

(The treatment in the above case was given ten or twelve years ago, this letter was dated Jan. 28, 1898.)

The foregoing letters are sufficient to give the reader a good idea of the theory and practice of Mental Healing.<sup>1</sup>

We may take this opportunity to call attention to one fact, often misunderstood: It is supposed by many who have given no special attention to the subject, that those upon whom these methods are successful, are the ignorant or superstitious, or else those whose diseases are imaginary.

That such is not the case, is evident from these letters, and will constantly appear in others to be quoted later. Many of these people are college bred, nearly all show that they are cultured and refined.

As to their diseases, while we have thought best to omit names of physicians and institutions, we may say that in nearly all cases the names were given, and were physicians in good standing; and in some cases, the most noted specialists. So that while we may see later that the troubles were of mental origin, yet they were far removed from what is ordinarily understood by "imaginary."

Such cases as the foregoing are sufficiently striking to arouse interest in mental healing, and when we recall that they are only fair examples of cases that are being reported on all sides, we cannot wonder that the uncritical are continually being led to believe in the absolute infallibility of these methods.

Before jumping to this conclusion, however, it is necessary to examine critically all the circumstances that may explain these "miracles" by referring them to recognized laws. We have accordingly examined all the data for "internal evidence" of rational explanation on the basis of known facts; secondly we have searched medical literature for, first, physical conditions favoring the appearance or sudden disappearance of disease, and secondly for cases of "miraculous" cures in general medical practice. We have found much that tends to modify any hasty judgment that one might have been tempted to make.

The first thing to be mentioned is the hysterical diathesis. This is a condition far more prevalent and troublesome than most people realize. It is a mental state without, so far as is known, any pathological condition behind it. It is a form of mental alienation characterized, as Krafft-Ebing says, by great lability and emotional prodigality. It is perhaps best characterized as a condition in which the emotions preponderate over the intellect and the will. The disease exists in all degrees, from the slightest deviation from the normal to the completely insane. There are no pains that may not be of hysterical

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<sup>1</sup>Of the hundreds of similar letters, each one interesting and instructive, that we have received, lack of space forbids more than these few, in this article.



origin. Diseases of the joints are among the most common. Neuralgia is often of hysterical origin. The functional actions of the viscera are especially liable to derangement in hysteria. Any organ may be affected, but the stomach seems to be the favorite one. Not infrequently organic disease of the heart is simulated, there being palpitation and general irregular action of this organ.

Nor are the conditions thus manifested, superficial appearances merely. They frequently baffle the most skillful physicians, for a time at least.

It is impossible to tell what proportion of our cases belong to this class, but it seems very certain, from their own testimony, that a relatively large percentage belong here. One cannot read far in the records of cases without seeing it "between the lines" if not in them.

It is hardly necessary to add that mental science is just the thing for these people. Dr. Edes thinks it well (Shattuck Lecture, 1895, p. 48,) "to look the fact squarely in the face that some persons do receive great benefit from some of these forms of treatment who have failed to do so at the hands of regular and skilled practitioners."

Without doubt the different schools of mental practice have been largely recruited from this class of patients.

The question of diagnosis, although of great importance and having received much attention in our study, need only be mentioned here. Suffice it to say that we find a large percentage of cases diagnosed solely by the patient herself or her interested neighbors. (Comment is unnecessary.) Many others prove to have been the victims of "Quacks." Finally, the best physicians are fallible. And no one knows this so well as the physician himself. It is true he does not go around publishing his ignorance or the weakness of the science of medicine, he understands the influence of mind too well to do that, and yet he often finds himself helpless in the presence of symptoms that he cannot understand.

Mental healers often complain that the regulars will never acknowledge a cure by mental science, of consumption or any serious case, but always take refuge in wrong diagnosis. We ought not be surprised that the physician takes this view of the case. There are manifestly three possibilities—three explanations of any such event as the cure, *e. g.*, of cancer, by mental methods. Either the Mental Science view is correct, or cancer is not the incurable disease that it is regarded, or the physician was wrong in his diagnosis. Clearly men will differ as to which view they will accept. The physician, who knows the whole history, the physiology and etiology of cancer, who has seen every kind of remedy tried including divine healing, without



success; is the first to admit his mistake when he sees the disease that he thought was cancer, cured. He cannot do anything else, and he would do the same if his own remedies had cured the disease.

The mental scientist, however, again complains, and with apparent justice, that it is illogical and unscientific for the doctor of medicine to make an arbitrary classification and declare all diseases incurable which he has been unable to cure. And when a new claimant for therapeutic honors comes into the field, he rejects it on the basis of the old determination that such diseases are incurable. The argument is good, and yet, so long as the physician puts himself under the same rule, he cannot be accused of unfairness. In reality his procedure is the only possible one. Any other would lead to inextricable confusion.

We must act on the basis of what is most probable; and in this, Mental Science stands on the same ground as any drug. Whenever any remedy, be it drug or idea, is shown to cure cancer oftener than the law of chance will allow spontaneous cure or wrong diagnosis, then and not until then will it be accepted as a specific for that disease.

We have thus tried to show that the question of diagnosis must always be considered, and can never be settled. Cures based on the patient's own diagnosis, or that of a quack doctor, are of no value. Those based upon the diagnosis of a regular physician may have all values, from very small to very great. They cannot be valueless, since we all rely upon the judgment of these men, and if Mental Science will cure what the doctor of medicine has called a fatal malady, we will have Mental Science whether the doctor of medicine was right or wrong. Neither can Mental Science be established on the authority of any single physician, however great the presumption may be that his diagnosis was correct. Only the cumulative evidence of a great many cases can constitute a demonstration.

Spontaneous cures of all kinds of diseases are recognized by physicians. Spontaneous cure of consumption is not infrequent. The nature of cancer makes such an event possible, and it has been claimed, though most authorities say they have never seen such, and they rather doubt the evidence for it.

The sudden appearance and equally sudden disappearance of non-malignant tumors is a fact of such common occurrence as to excite no surprise in the minds of physicians.

J. William White, M. D., of Philadelphia, in an article entitled "The Supposed Curative Effects of Surgical Operations Per Se" (*Annals of Surgery*, Aug. and Sept., 1891,) has shown that many diseases have been cured by the "reaction of traumatism" due to the simple preliminary cutting; the intended

operation having been given up on account of the conditions found, rendering such operation impracticable.

Dr. White says of his cases "I have not intended to include in this article any extended cases in which the disease is purely imaginary, though the field that would be opened up in this direction would be very fruitful." (p. 173.)

(p. 174.) "In seeking for a reasonable explanation of the phenomena observed in the preceding cases, four influences are noted: 1. Anæsthesia. 2. Psychical influence. 3. Relief from tension. 4. Reflex action or the 'reaction of traumatism.'"

Upon experiment, anæsthesia was found to have either no effect, or else an injurious one.

On the question of psychical influence, he says "in so far as any case is of hysterical or imaginational origin, its cure by a powerful mental impression is easily understood. But only a small proportion of my cases were of this character, if the reporters may be believed."

"In so far as clinical experience goes it would appear that all kinds of tubercular peritonitis have undergone resolution after abdominal section and consequently that they are all curable."

William Goodell, Philadelphia, March 27, 1891, says:

I have had two cases of fibroid tumors of the womb as large as the adult head, dwindle down almost to an inappreciable size after an exploratory incision. In each case the object of the operation was the removal of the ovaries. But they lay behind a universally adherent tumor and could not be touched.

Joseph T. Johnson, Washington, D. C., March 24, 1891, says:

I have opened the abdomen in two cases when I did not know what was the matter, and don't now, but the patients both got completely well. One appeared to be malignant, and for that reason, upon the advice of all present, I abandoned the operation and told her husband I thought she would die. She got well and has since had a baby and is now in good health.

H. J. Boldt, New York, March 9, 1891, writes:

A young woman complained of most intense pain in left ovary. She really was in agony. This continued several weeks. She lost flesh, was bedridden, temperature 101 to 103, could not be touched in the ovarian or hypogastric region without a scream.

On opening the abdomen, absolutely nothing was found to account for the symptoms. She was merely washed out and sewed up again. Recovery in every respect was prompt and perfect.

Another class of cases that is often quoted as among the most startling, has to do with muscular functions. These are the inability to walk, from various causes, such as one leg short, paralysis, sprain, etc., etc. Dr. Dowie prays with these people, tells them to walk and they obey, much to the surprise of all, and to the glory of God as they devoutly believe.

But such phenomena are not unknown to the medical profession. Dr. Henry Ling Taylor has made a speciality of such cases, and achieved results as surprising as any reported by Divine Healing. He explains his method and gives illustrative cases in an article which he entitles, "Hygiene of Reflex Action." (Journal of Mental and Nervous Diseases, March, 1888.) The following parallel cases will show the general plan. Out of a great number of cases of cure by Divine Healing we must restrict ourselves to three.

M., 18. Diseased thigh bone nineteen months. Amputation ordered. Healed instantly. In three minutes was walking rapidly around the hall.

M., 40. Lame in one leg; paralysis, resulting from a fall of forty feet. A familiar sight in streets of Mansfield, Ohio, wheeling himself in his chair. After one week at D.'s he threw away his crutches. His limbs are not quite straight yet, but is confident they will become so. Two joints of spine were caved in; are now coming back into place.

This account was given in the paper in town where he was well known and was given as an accepted fact.

F., 19. Paralysis of right leg from knee down; no feeling in it; much withered; one and one-half inches short. Heel cord had been cut by surgeon and lacked an inch of meeting. Dr. Dowie performed the ceremony of "laying on of hands" and prayed. When he laid his hands on my leg, as he moved them down towards my foot, I could feel the blood trickling into the veins quite distinctly, and when he had reached the toes of my foot I had perfect sensation. He had gently pulled my leg during his prayer, and my leg at once lengthened to an equality with my left leg, in fact it was just a very little longer, and so it remains. Heel cord was instantly united. Five days later, walked ten miles without fatigue. Leg has grown to nearly the size of the other.

Compare these with the following mental cases treated by Dr. Taylor: (*op. cit.*, p. 138.)

M., 38. Suffered three months from sprained ankle, pain and disability; could not walk. Diagnosed as "disturbed reflexes." Began education of reflexes, and was discharged cured in six days; locomotion entirely normal. Eight months afterward, reported still perfectly well.

F., 50. Turned ankle two years previously, by stepping on orange peel. Pain, swelling, and disability. Had been worse during last six months. When induced to move ankle, said she had never tried before and did not know she could. Crutches were thrown away, and in a week she said she did not know she had an ankle. Entirely cured.

M., 17. Athlete. Left knee had given out while tramping in Germany, six months previously. Limped and thought knee was swelled. Had used a crutch and cane for ten weeks. Was energetic and ashamed of hobbling. The case was diagnosed as "limb suffering from disuse." Was made to stand up and bear weight on both feet. Inside of five minutes was walking around the table without assistance; went out on street and up front steps; at end of fifteen minutes he walked without a limp. His family were bewildered. Never had any trouble afterwards, and played on the Harvard foot-ball team Thanksgiving, 1887.

F., 12. Spinal trouble. Brought to office in a chair. It was perfectly evident that the entire family including patient were intently

watching for the development of expected symptoms. Diagnosis was made of "reflex debility, the effect of too much mother." On the ninth day she walked two miles, and the next day walked up stairs.

Young lady. Pott's disease; plaster jacket; great pain. In spite of remonstrances of parents, jacket was removed and exercise given. Went home in two months in fair health and much relieved. Later, relapsed.

F., 34. Bed and wheel chair for seventeen years. That this patient was walking within *a few days* and improved steadily in all respects, is due largely to her own intelligent and hearty co-operation, once the condition was explained to her.

These cases are so strikingly similar to a large class of the Dowie cases, that one cannot doubt that while the mental element is the chief feature in them both, yet Dr. Taylor would have been just as successful with Dowie's cases as he was with his own.

Attention is also called to the great liability to error in reporting cases. However good the intention, most people will forget some part of the facts. The way in which people understand or repeat what "the doctor said" is sometimes amusing and often provoking to the doctors.

#### POSITIVE TESTIMONY TO THE INFLUENCE OF MIND IN DISEASE.

In the preceding section we have attempted to give a fair statement of all the objections that can be raised to the evidence upon which the mental control of disease is supposed to rest. In the present section we shall sum up the arguments on the other side, and show the valid arguments in favor of this influence.

We may recall first, the great place that is actually conceded to mental influence in disease, by the popular mind. That sickness is often caused and cured by emotional states: as fear, grief, etc., is a matter of common experience. In every well regulated sick room, great care is taken to furnish the patient with pleasant and agreeable surroundings, because they help toward convalescence, and to shut out the opposite conditions, because they hinder.

Dr. Tukes's two volumes on "The Influence of Mind on Body," contains a valuable collection of these occurrences.

Perhaps the same argument will be urged by the unconvinced against the practice of mental therapeutics, that is used by telepathists, when one demands experimental proof, namely, that it is a force that works spontaneously, and cannot be harnessed into experimental methods. The very act of trying to observe it dissipates it, like the introspective study of an emotion.

As a matter of fact, however, we have abundant experi-

mental proof of the value of mental practice for the cure of disease.

In spite of the severe criticism that we have made of reports of cure, there still remains a vast amount of material, showing a powerful influence of the mind in disease. Many cases are of diseases that have been diagnosed and treated by the best physicians of the country or which prominent hospitals have tried their hand at curing, but without success. People of culture and education have been treated by this method with satisfactory results. Diseases of long standing have been ameliorated and even cured.

The numerous instances of temporary arrest of the disease, while not showing power to cure, yet exhibit a wonderful power of some sort.

Similarly, the cases where disease is cured in one part but breaks out in another part of the body, clearly prove the great power of mind, although they also show that the power is not unlimited. The most striking case of this, is the instance of the man who was healed of gangrene in the foot but died later of the same disease located in the eye.

We have traced the mental element through primitive medicine, and Folk medicine of to-day, patent medicine and witchcraft. We are convinced that it is impossible to account for the existence of these practices, if they did not cure disease, and that if they cured disease, it must have been the mental element that was effective. The same argument applies to these modern schools of mental therapeutics—Divine Healing and Christian Science. It is hardly conceivable that the large body of intelligent people who comprise the body known distinctively as Mental Scientists could continue to exist, if the whole thing were a delusion. It is not a thing of a day; it is not confined to a few; it is not local. It is true that many failures are recorded, but that only adds to the argument. There must be many and striking successes to counterbalance the failures, otherwise the failures would have ended the delusion.

The testimony of regular physicians to the efficacy and remarkable results of mental treatment is strong evidence of its value. The admission that they use it in some form is a further corroboration of the view that it is efficient. A few instances out of the many that have been collected, and the innumerable quantity that might be collected, are here appended.

One of the most prominent physicians of New York city prescribed salt water for a nervous affection that had defied all other treatment. His directions were: "Take 15 drops, and be careful not to take an overdose or it might prove fatal; and be sure to take it regularly." The patient rapidly recovered.

A certain druggist told the writer that he put up a prescription of salt water, for which he charged \$1, by the physician's direction, the physician explaining that unless the patient paid a high price, he would not think the prescription good for anything. He was cured.

An interesting illustration of the effect of the mind in causing disease, comes from a very prominent Chicago physician. He writes that on one occasion, he was very much interested in an important case that was referred to him, after failure by other physicians. He was intensely anxious to succeed. He discovered symptoms which had been overlooked by the others, of duodenal catarrh. He lay down on the couch in the evening, to read a recent work on the subject. He fell asleep from sheer exhaustion, his mind "full of the pathology, symptomatology, etiology and treatment of such conditions." He awoke in two hours with an *intense duodenal catarrh*, that lasted several days before he could get it under control.

#### FAILURES IN THE PRACTICE OF MENTAL THERAPEUTICS.

In the foregoing pages we have said little about failures in any of the different methods.

It becomes necessary, however, in our study of the question and our effort to reconcile the different practices, or find the law underlying them all, to consider the cases where they fail as well as those in which they succeed.

The ratio of successes to failure is impossible to determine, for part of the healers do not admit that they ever fail, and nearly all refuse to keep any record of failures. On the other hand, hypnotists restrict themselves at the start, and only use hypnotism in certain cases; of these they keep a careful record both of successes and failures.

That failures are numerous is the common belief, and is undoubtedly the fact. Indeed, unless *materia medica* is growing correspondingly impotent, they must equal the failures by the old methods, since there is no change in the death rate as a whole or the mortality from any particular diseases, in spite of the remarkable growth of mental practice in the past few years.

It has been exceedingly difficult to collect records of failure, for the purposes of study, since not only do the healers conceal their failures, but people who have tried to get cured by mental methods and failed, seem to regard it as a disgrace or at least a weakness, and will not report their experiences. Nevertheless by continued effort we have succeeded in finding several people who looked at the matter from a broader standpoint, and were quite willing to submit their own experiences or those of their patients (in the case of healers) for what they will show of value in elucidating the law of mental therapeutics.

Under the head of Divine Healing, occur many failures, and they are usually accounted for by the assertion that the patient did not have sufficient faith. Later we shall see in what sense this is true.

Dr. Dowie reports a few deaths in his "Home." Many of the patients say "not yet healed," though they are still hoping. Many of these finally give up in despair.

But the most conclusive indication of the extent of failure, comes from Dr. Dowie's own statement. He says, in a certain issue of his paper: "I pray and lay my hands on 70,000 people in a year." At that rate he would have prayed with 175,000 in 2½ years. But in the 2½ years immediately preceding this statement, he reports only 700 cures. The conclusion is indisputable that only a small portion of those prayed with are cured.

Failures by the Christian Science method are frequently brought to public notice by the courts, when parties are censured, fined or otherwise punished for neglecting to employ a regular physician, but trusting to Christian Science with results fatal to their friends. There are also many failures, that do not result fatally, and so do not get into the papers. The patient simply is not cured, and endures his disappointment and his ills with whatever fortitude he can command.

The following statement from a lady of culture, experience, and calm and unbiased judgment, is valuable and interesting for many reasons.<sup>1</sup> It will be noted that it comes from one who is neither a "healer" nor an opponent to the practice. She has all the interest which is involved in a mother's desire for the welfare of her daughter. Yet it is evident that she has not gone blindly into the matter, or closed her eyes to facts as they have come in evidence. The whole tone of fairness, and wise discrimination, is refreshing, and makes the testimony of extreme and unusual value.

It is as follows:

A partially successful case, was that of my daughter, whose temperament from childhood was extremely nervous. For several years she attended a denominational school, was very religious, and wished to enter into religious work.

At about the age of 22 she was very sick with a contagious disease. [The writer also mentions prominent physicians who treated her, at this time and also later.]

The disease left her with blood poisoning, resulting in nervous

<sup>1</sup>The original letter was very complete and detailed, written with the utmost freedom and confidence but not for publication. The following condensation was made by the present writer and submitted to the lady for permission to publish, which permission was given. This accounts for its present form and the absence of some details.



prostration. She grew worse and a consultation was held. Dr. ——— pronounced her not insane, as we feared. She was sent to ——— [mentioning one of the most valuable medical institutions in the country], then went to a private institution. It was nearly a year before she came home, better, but far from well, still hysterical and hypochondriacal. She had taken no medicine (unless a simple calmative) for a long time, and discontinued that on coming home. Soon after her return, she heard of mind cure, and wished to try it. She improved somewhat under the treatment and afterwards continued it under ——— [mentioning one of the most experienced, most successful, and best Mental Science healers in practice.]

I think her treatment combined all the methods mentioned. The absent had the least effect. In those cases appointments were made for certain hours. Her mind was presumably occupied with peaceful and lofty thoughts, charity and good-will to all mankind. Bitterness, anger, resentment, even towards enemies, must not be entertained for a moment, otherwise the treatment would be ineffectual.

———'s treatment was continued regularly for about six months, afterwards given occasionally. The improvement was slow but generally steady. The next summer we thought the cure complete. The strongest evidence of the cure was the taking up again of her old duties and interests and submitting to suggestions and advice. The moral effects of the science were good, the tendency being to make one rise superior to all the annoyances and even the trials of life,—in short, it was a religion. Sometimes, however, this idea was carried too far.

I attribute the apparent success at first to the fact that she was taken out of the rut into which she had fallen. She had become a hypochondriac, and her physician had told her that she could help herself more than any one could help her. It seemed that where her malady was imaginary, the "Science" helped her, but where it was real, there was no effect. Her naturally vigorous constitution asserted itself for a time, but while the poison remains in her blood she can never be well.

For past nine years she has continued to a certain extent the same treatment, but it is without any perceptible effect, or at best only a negative one—she might be worse without it, and probably would, for her faith is undiminished, and she absolutely refuses to consult a physician for any ailment.

The literature that I have read upon this subject is quite beyond my comprehension, although I have tried earnestly to understand and believe in it. I recognize much that is beautiful and helpful in its teachings and believe they might be used to advantage in connection with medical science and remedies. I have known too many absurdities claimed for it and too many

fatalities resulting from trusting to it blindly, to have entire faith in it. Instance the case of ———. (Here is cited a tragic instance of death under this treatment.)

Neither in my school education or in that of my children, was anything taught bearing upon this subject nor upon any form of psychology.

I think it would be most unwise to teach such subjects to the young, at least until further knowledge brings them into the class of exact sciences. There is so much delusion, exaggeration and fraud connected with these subjects as to make it almost impossible for even mature minds to reach the simple truth, and there is too much of real importance and profit to be learned, to spend time uselessly.

In this statement I do not mean to include all psychology.

Sincerely yours,

There is abundant evidence that this letter might be considered practically a résumé of the entire mass of data so far as the points covered. The experiences here recorded, and the conclusions of the writer are strikingly typical.

But just now, we desire to point out a few of the noticeable points. To begin with, the daughter was "from early childhood extremely nervous and was very religious." These are the most favorable conditions for the successful use of Mental Science. This is admitted by all.

2. Her Mental Science healer was one who stands at the very top of the profession. 3. Absent treatment, for which so much is claimed, had "least effect." This absent treatment was by appointment, and at these times the patient put herself into the proper state of mind as far as possible. 4. It was thought for a time that the cure was complete, but it proved to be only temporary. The temporary cure shows that the patient received the teaching and profited by it. Nothing succeeds like success; yet, in spite of the success and all the moral strength that comes from it, there was a relapse, showing that there was a physical condition which mental methods, *under the most favorable conditions, could not reach*. It was not because the patient gave up, lost faith, and refused to accept the teaching. For nine years she has held firm to the faith, with no other result than that she has perhaps been kept from growing worse. Could any more complete test be desired?

The mother's statement that "where the malady was imaginary, the treatment was helpful, but where it was real, it had no effect," is easily in agreement with Wundt's declaration (Human and Animal Psychology, pp. 333-4) that "It cannot be denied that a cautious and intelligent use of suggestion [Mental Science] may be of avail for the temporary, perhaps

even for the permanent, removal of diseases due to the functional derangement of the nervous system. . . . But it is equally undeniable that suggestion is in the long run just as ineffective for the cure of diseases arising from some palpable pathological cause, as would be any other form of command to the patient to grow well."

By far the best data we have for forming an idea of the failures and their relation to the cures, is the following record of cases treated at a Mental Science Home. This institution is under broad-minded and philanthropic managers who believe that some people are cured by this method. The healer in charge is an intelligent man fully imbued with the principles of Mental Science, but also full of the true scientific spirit, so that he has regard to results as well as to his theory. All cases are welcome at the home, and all receive the best of attention and treatment. They stay until they are cured or discouraged or the healer is convinced that they cannot be further benefited. No pride or prejudice seems to be present to hide the facts. The following statements are clear and concise; accurate, as far as the healer is concerned. Doubtless many of them are the patient's own version of the case, while many are the diagnoses of prominent doctors of medicine previous to the patients coming to the "Home."

It will be seen that less than half are pronounced cured or well, less than half again only improved to a greater or less extent, while quite a large percentage (about 15%) were not helped.

The same disease is sometimes cured and sometimes not helped. These results agree remarkably with those of hypnotism, and altogether we believe are fairly representative of what would be found if we could get a careful record of all the cases treated by all the different mental methods.

Miss C. Spinal trouble, epilepsy, prolapsus of uterus, and malarial chills. Cured.

Miss R. Nervous prostration, neuralgia, epilepsy, and impoverished blood. Not much improved.

Miss B. Nervous dyspepsia, hemorrhoids, painful menstruation, sleeplessness. Improved.

Miss F. Pneumonia. Cured.

Miss S. Scrofula bunches. Cured.

Miss C. Sciatica, neuralgia, severe headaches and nervous prostration. Improved.

Miss A. Congested brain and spinal trouble. Improved.

Miss L. Cough resulting from pneumonia, nervous debility and depression. Improved.

Miss F. General debility, mental depression and eyesight impaired from inflammation resulting from a surgical operation. Cured.

Mrs. B. Stones in the bladder. Greatly benefited.

Mrs. M. Rheumatism, uterine trouble, indigestion and catarrh. Great improvement.

Miss W. Spinal trouble, and a growth in side. Cured.

Miss K. Uterine tumor and in too weakened a condition to admit of an operation. Four years could not speak aloud and two years could not even whisper. She was in an extremely nervous and weakened condition. A complete cure.

Miss B. Kidney trouble and nervous prostration. Cured.

Mrs. C. Hysterical, causing spasmodic contraction in the throat muscles, preventing her swallowing liquid foods with safety. Cured.

Mrs. T. Mental and physical troubles. Fully restored.

Miss F. Impaired eyesight, had worn glasses sixteen years and could not depend upon her eyes even with those. She left off glasses and her eyes were cured.

Miss K. Consumption. Improved for a few weeks then grew worse.

Miss C. Nervous prostration, dyspepsia, and painful menstruation. Cured.

Miss C. Eruption on face and chest, from chicken pox five years previously. Cured.

Miss W. Locomotor ataxia. Not benefited.

Mrs. W. Overwork, back strained by lifting, was unable to sit or stand without great suffering. Cured.

Mrs. L. Depression; little improvement. Constipation; relieved.

Mrs. B. Displacement and inflammation of uterus. Fully regained health.

Miss S. Advanced Bright's disease. Unsuccessful.

Miss H. Neurasthenia with hysterical symptoms; was never well. Change for better.

Miss T. Severe headaches from sunstroke. Very much improved.

Miss S. Nervousness and headaches. Unsatisfactory.

Mr. A. Mental trouble, unfitting for business five years. Greatly improved.

Mrs. D. Uterine trouble, hysteria and severe depression. Is well.

Mrs. D. Catarrh of bowels. Rigid diet five years; had spasms from changing diet and was unable to leave room. Eats any reasonable food and walks. Improved.

Miss F. Creeping paralysis. Stronger, but the trembling not improved.

Mrs. P. Paralysis of right side. Very little improvement.

Mrs. S. Nervous prostration. Marked improvement.

Miss S. An overworked teacher. Rested and strong.

Mrs. P. A humor, said to be incurable, uterine trouble and life-long nervousness. Cured.

Miss B. Mental trouble and lack of will power. Unsatisfactory.

Miss R. Paralysis or locomotor ataxia. Gained strength.

Miss S. Ovarian trouble, ulceration of stomach and bowels, liver in an atrophied condition. Cured.

Miss H. Uterine trouble, dyspepsia and general weakness. Cured.

Miss B. Dyspepsia and hysteria. Improved.

Mrs. F. Severe case of constipation. Uterine trouble and mild form of insanity. Cured of the first, much improved in second, and left us very happy.

Mrs. S. Uterine trouble, constipation, and nervous prostration. Very much improved.

Mrs. H. As severe a case of depression as we ever had, and nervous prostration. The cloud was lifted and she is bright and well. Cured.

Miss D. Nervous prostration. Improved.

Miss B. Uterine trouble and a nervous wreck. Much benefited.

Miss H. Uterine trouble, constipation, depression, painful menstruations, and nervous prostration,—an invalid from childhood. Greatly benefited.

Mrs. P. Cancer. Unsuccessful.

Mrs. R. Heart trouble and dyspepsia. Not much improved.

Miss C. Insanity. Not successful.

Mrs. S. Heart trouble, dyspepsia, and nerves in wretched condition.

Mrs. L. A tired and nervous teacher. Was ready for work when she left us.

Miss G. Painful menstruation. Greatly relieved.

Mr. H. Polypus tumor in nose, and very nervous. Greatly helped.

Mrs. C. Chronic hay fever. Permanently much improved.

Miss C. Heart trouble, rheumatism, and deafness. Unsatisfactory.

Mrs. G. Hysteria and insomnia. Improved.

B., 8 yrs. Malaria and a cough, result of whooping cough. Cured.

Miss C. Over study. Left well and strong.

Mrs. H. Heart trouble ten years. Some improvement.

Mrs. W. Ovarian trouble and addicted to morphine habit. Unsatisfactory.

Miss H. Spinal trouble, ovarian tumor with adhesions, inflammation throughout the abdominal region, enlarged and displaced uterus, rectal abscess, throat trouble, weak lungs, bi-

valvular affection of the heart, trouble with head and eyes, glasses for five years, abscesses for six years from belladonna poisoning, extreme sensitiveness of nerves and much numbness from same cause. My physicians said I had not a sound organ in my body. Glasses given up and eyes well. A complete cure.

Mrs. B. Heart trouble and nervous debility. Much improved.

Miss R. Difficulty in walking—doubtless locomotor ataxia. Unsatisfactory.

Mrs. H. Indigestion, uterine trouble, melancholia. Not ready for this treatment.

Rev. S. Stiff knee and spinal trouble from fall 13 years ago. Weak and lack of endurance. Gained in strength, but lameness not helped.

Miss S. Nervous prostration. Great gain.

Mrs. A. Extreme depression. Not satisfactory.

Miss R. Fibroid uterine tumor, and so depressed that she took very little interest in anything. *No change in the physical trouble*, but the great mental burden was lifted and she gained strength.

Miss M. Retroversion and inflammation of the uterus, and in such a serious condition that the physicians said she must undergo a surgical operation. This trouble of 20 years' standing, and dyspepsia of 3 years. Cured.

Mrs. B. Constipation, palpitation of heart, insomnia and general debility, greatly improved. Constipation cured.

Miss C. Consumption and general weakness. Gained strength.

Finally, we have in hypnotic treatment the most perfect demonstration of mental cures that can be found. Only one thing could be desired. The physicians who use hypnotism have been so careful, in their effort not to abuse it and not to endanger in any way their patients, that they have not tried it for all possible conditions, so that we do not know what it could accomplish under all circumstances.

But so far as it has been tried, we have exact data, and positive testimony to its power. Hypnotic suggestion is as certainly a cure for neuralgia as any drug that is known. The data furnished by hypnotic cures, is as free from the objections urged in the previous chapter, as one could reasonably demand. The use of hypnotism is confined, in its therapeutic aspect, to physicians of high standing, who assign to hypnosis a place equal in importance to drugs and other methods—and no greater. They test it as they would test a new compound or regimen. They study the results impartially. They have no theory to defend, no religious dogma to support, and their judgment is

not overcome by emotions due to the fact that they themselves have been healed by this method.

In view of these facts we may reasonably turn to hypnotism for the foundation of our more exact study of the theory of Mental Science.

#### HYPNOTISM AS A THERAPEUTIC AGENT.

In the therapeutics of hypnotism we come to a subject at once vast and valuable. Its vastness is indicated by the fact that in 1888, there were recognized 801 writings by 481 authors, and 207 periodicals containing articles on hypnotism. And in the past 10 years the interest and the literature has enormously increased.

We shall confine ourselves to a few careful practitioners, whose cases number something over a 1,000. Following are the facts deduced from these reports.

The range of diseases treated by hypnotism is not so large as we have found under Mental Science and Divine Healing, since physicians have not thought it right or advisable to try hypnotism in all diseases, while the theory of Mental Science and Divine Healing compels them to make use of their method in all cases.

Before going into the more detailed accounts of hypnotic cures, a word should be said about the manner of treatment, and some illustration of the methods given.

There are many methods of inducing the hypnosis, and there is some diversity in the kind of suggestion given after the hypnosis is induced.

The following cases are taken from the practices of four different men, and will indicate the scope of the work and the results.

Baierlacher reports using hypnotism on 58 patients: 24 males, 34 females, between 16 and 71 years of age. 7 M. and 8 F. were unhypnotizable.

He reports success in cases of colicky pains following abortion, catarrh of stomach, occipital neuralgia, irregular and painful menses (case of each), muscular rheumatism, and minor ailments. Reduced pulse from 92 to 76, and from 86 to 76. Consumptive pulse of 120 was not changed. Failures were met with in cases of traumatic neuralgia, traumatic neurosis, neuralgia of both legs, apoplexy, hemiplegia, persistent insomnia, emphysema of both lungs, and extreme dizziness.

According to Van Eeden, who reports 718 cases where he used hypnotism, only 19 of whom were unhypnotizable; nervous condition and sex have no effect in determining susceptibility to hypnosis; character and age, however, are important factors.



Dr. Van Rhenterghem states that of 178 patients, he failed to hypnotize 7. He treated 162, of whom 91 were cured, 46 improved, and 25 unimproved. There were 37 different diseases represented.

The following is a tabulation of a part of them.

	Treated.	Improved.	Cured.	Not Cured.
Rheumatic pains,	16	2	13	1
Various hysterical attacks,	24	7	14	3
Various neuralgias,	9	2	6	1
Epilepsy,	3	3		
Indigestion, etc.,	12	2	10	
Deafness,	11	7	1	3

Esdaile, who worked under the old belief in mesmerism or a "magnetic" fluid that passed from the hands of the operator to the patient, reports a few cases treated by him in India. He seems to have had unusual success in producing anaesthesia sufficient for the performance of difficult surgical operations. He was also successful in curing by hypnotic treatment several serious troubles.

The following is his statement:

(Mesmerism in India, by James Esdaile, M. D., London, 1846.)

A return showing the number of painless surgical operations performed at Hoogly, during eight months.

Arm amputated,	1	Sinus 6 inches long laid open,	1
Breast, ditto,	1	Heel flayed,	1
Tumor extracted from upper jaw,	1	End of thumb cut off,	1
Schirrus testium extirpated,	2	Teeth extracted,	3
Penis amputated,	2	Gum cut away,	1
Contracted knees straightened,	3	Prepuce cut off,	3
Ditto, arms,	3	Piles, ditto,	1
Operations for cataract,	3	Great toe nails cut out by root,	5
Large tumor in groin cut off,	1	Seton introduced from ankle to	
Operations for hydrocele,	7	knee,	1
Ditto, dropsy,	2	Large tumor on knee removed,	1
Actual cautery applied to a sore,	1	Scrotal tumors weighing from	
Muriatic acid, ditto,	2	8 lbs. to 80 lbs., removed,	17.
Unhealthy sores pared down,	7	Painless,	14
Abscesses opened,	5		
		Operations,	73

A return of medical cases cured by mesmerism during eight months.

Nervous headache, cured by one		Lameness from rheumatism, by	
trance,	3	chronic treatment,	2
Ticdoloureux, cured by one		Lumbago, by general and local	
trance,	1	mesmerising for a week,	1

Nervousness and lameness from rheumatism of 2½ years stand- ing, I	Sciatica, for general and local mesmerising for a week, I
Spasmodic colic, by one trance, I	Pain in crural nerve, by general and local mesmerising for a week, I
Acute inflammation of the eyes, by repeated trances in twenty- four hours, I	Palsy of one arm, by general and local mesmerising for one month, I
Chronic inflammation of the eyes, by chronic treatment, I	Palsy of half the body, by gen- eral and local mesmerising for six weeks, I
Acute inflammation of testes, by repeated trances in thirty- six hours, I	Feeling of insects crawling over body, by one trance, I
Convulsions, by one trance, I	
	18

"By chronic treatment is meant, daily mesmerising without the intention of entrancing the patient, which is not necessary."

(P. 22). Author recounts experience with most famous magician in Bengal. He shows that the magician's method of treatment is really hypnotism.

The following report of Dr. Parkyn<sup>1</sup> may be somewhat exceptional, but it is, nevertheless, very remarkable, and indicative of what may be expected from mental therapeutics.

He says:

"In the past eighteen months we have not seen a case of nervous prostration which has not been cured in a few weeks, when suggestion was properly used. Appended is a report of sixteen consecutive cases successfully treated at the Chicago School of Psychology within a short time, and without a failure.

Name.	Age.	Time dis- ease existed.	Increase in wt. in pounds.	Length of treatment.	Result.
K. D. W.,	46	20 years	12 pounds	1 month	cured
L. M.,	23	8 "	14 "	1 "	"
C. T.,	30	2 "	9 "	3 weeks	"
F. B. T.,	51	3 "	12 "	6 "	"
W. M.,	47	5 "	6 "	1 month	"
Miss M. B.,	34	2 "	12 "	1 "	"
" M. C.,	23	3 "	8 "	1 "	"
" W. N.,	33	4 "	8 "	1 "	"
" H.,	30	1 year	14 "	2 months	"
Mrs. S.,	24	2 years	7 "	1 month	"
" G.,	43	3 "	10 "	2 months	"
" W.,	43	6 "	18 "	1 month	"
" J. C. N.,	57	2 "	7 "	1 "	"
D. R. G., <sup>2</sup>	37	4 "	23 "	1 "	"
C. S.,	44	5 "	15 "	2 months	"
P. T. C.,	55	18 "	8 "	1 month	"

<sup>2</sup> Gained 12 lbs. first week of treatment.

<sup>1</sup> From "Suggestion an Infallible Cure for Nervous Prostration," by Herbert A. Parkyn, M. D. "Suggestions," Vol. I, No. 3, p. 105.

BERNHEIM'S HYPNOTIC CURES. (From Suggestive Therapeutics.)

*A. Organic Diseases of the Nervous System. 10.*

1. Cerebral hemorrhage, hemiplegia, hemianæsthesia with tremor and contracture. Cure.
2. Cerebro-spinal disease: apoplecticiform attacks, paralyzes, ulnar neuritis. Cure.
3. Partial left hemiplegia. Cure.
4. Traumatic epilepsy with traumatic rheumatism. Cure.
5. Sensory organic hemianæsthesia. Cure.
6. Diffuse rheumatic myelitis. Improvement.
7. Cerebro-spinal insular sclerosis. Marked improvement for six months.
8. Nervous troubles (organic cause?) in the brachial plexus. Temporary suppression of the symptom. No cure.
9. Paresis of traumatic origin of the muscles of the hand. Cure.
10. Paresis of the extensors of the hand and saturnine anæsthesia. Cure.

*B. Hysterical Diseases. 17.*

11. Hystero-epilepsy in a man, sensitivo-sensorial hemianæsthesia. Cure.
12. Hysteria, sensitivo-sensorial anæsthesia. Transient suppression of the symptoms. No cure.
13. Hemiplegia with left sensitivo-sensorial hemianæsthesia. Cure.
14. Hysterical sensitivo-sensorial hemianæsthesia. Cure.
15. Hysteriform Paroxysms with hysterical somnambulism. Cure.
16. Anæsthesia. Hysterical spinal pain. Cure.
17. Paralysis with hysterical anæsthesia. Cure.
18. Convulsive hysteria with hemianæsthesia. Cure.
- 21, 23, 24. " " " " "
- 20, 22. Convulsive hysteria. Cure.
19. Hysteria. Paroxysms of convulsive weeping. Cure.
25. Hysteria with hemianæsthesia. Cure.
26. Hysteria in male: weeping, convulsion, paroxysms. Cure—at least temporary.
27. Hysterical aphonia. Cure.

*C. Neuropathic Affections. 18.*

28. Nervous aphonia. Cure.
29. Moral inertia and subjective sensations in the head. Cure.

30. Nervous aphonia. Cure.
31. Post-epileptic tremor, cephalalgia and insomnia. Cure.
32. Nervous gastric troubles. Anæsthesia. Improvement.
33. Neuropathic pains. Cure.
34. Epigastric pains. Cure.
35. Neuropathic lumbar pains. Insomnia. Cure.
36. Paresis with sense of weight in right leg. Cure.
37. Pains in right leg. Cure.
38. Girdle pain and pain in right groin, with difficulty in walking for 20 months. Cure.
39. Insomnia. Loss of appetite, mental depression, tremor. Cure.
40. Gloomy ideas. Insomnia, loss of appetite. Cure.
41. Insomnia, through habit. Partial cure.
42. Cephalalgia, intellectual obnubilation. Cure.
43. Vertigo, moral depression connected with cardiac disease. Cure.
44. Laziness, disobedience, and loss of appetite in child. Cure.
45. Pseudo-paraplegia with tremor. Cure.

*D. Various Neuroses. 15.*

46. Choreic movements consecutive to chorea. Cure.
47. Choreic movements consecutive to chorea. Cure.
48. Choreic movements from moral emotion. Cure.
49. Post choreic tremor in hand. Cure.
50. Post choreic trouble in writing. Cure.
51. Choreic movements in hands. Cure.
52. Hemi-chorea. Rapid improvement. Gradual cure.
53. General chorea. Gradual cure.
54. General chorea. Gradual cure.
55. Obstinate writers' cramp. Rapid improvement. Gradual cure.
56. Attacks of tetany, nocturnal somnambulism. Cure.
57. Nocturnal somnambulism. Temporary cure.
58. Nocturnal incontinence of urine. Cure.
59. Nocturnal incontinence of urine. Cure.
60. Nocturnal aphonia consecutive to pneumonia. Cure.

*E. Dynamic Pareses and Paryalyses. 3.*

61. Sense of weight with paresis of left arm. Cure.
62. Dynamic Psychic paraplegia. Cure.
63. Pains and paresis of lower limbs. Cure.

*F. Gastro-Intestinal Affections. 4.*

64. Alcoholic gastritis with insomnia and weak legs. Improvement.

- 65. Chronic gastritis. Dilation of the stomach and vomiting. Improvement.
- 66. Gastric troubles. Burning sensation over sternum. Insomnia. Cure.
- 67. Gastro-intestinal catarrh. Metritis. Neuropathy. Improvement.

*G. Various Painful Affections. 12.*

- 68. Epigastric pain. Cure.
- 69. Umbilical and Epigastric pain. Cure.
- 70. Interscapular pain. Cure.
- 71. Thoracic pain. Insomnia. (Tubercular diathesis.) Cure.
- 72. Hypogastric and supra-inguinal pains on left, connected with old pelvic-peritonitis. Cure.
- 73. Intercostal pain. Cure.
- 74. Thoracic pain. Gradual cure.
- 75. Painful contusion of the deltoid. Cure.
- 76. Muscular pain in flank. Cure.
- 77. Painful spot in side. Cure.
- 78. Pains in the epitrochlea muscles. Cure.
- 79. Pain in shoulder and upper right limb from effort. Cure.

*H. Rheumatic Affections. 19.*

- 80. Rheumatic paralysis of right fore arm. Cure.
- 81. Rheumatic scapulo-humeral arthritis. Improvement without cure.
- 82. Muscular rheumatism, with cramp. Cure.
- 83. Ilio-lumbar rheumatism, neuralgia. Cure.
- 84. Arthralgia consecutive to an arthritis. Cure.
- 85. Pleurodynia and lumbar pain helped by suggestion. Cure.
- 86. Apyretic articular rheumatism. Gradual cure.
- 87. Chronic articular rheumatism. Cure.
- 88. Muscular, articular and nervous rheumatism. Gradual cure.
- 89. Acromio-clavicular and xiphoid rheumatic pains. Cure.
- 90. Muscular lumbo-crural rheumatism with sacro-sciatic neuralgia. Rapid improvement. Almost total cure.
- 91. Apyretic articular rheumatism. Gradual cure.
- 92. Acromio-clavicular rheumatic pains. Cure.
- 93. Muscular rheumatism arm and leg. Cure.
- 94. Gonorrheal rheumatism. Gradual cure.
- 95. Acromio-clavicular and xiphoid articular rheumatism. Cure.
- 96. Rheumatic articular pains. Cure.
- 97. Dorsal and meta carpal-phalangeal rheumatic pains. Cure.

98. Rheumatic dorso-lumbar, and sciatic pains. Cure.

*I. Neuralgias. 5.*

99. Rebellious Sciatica. Cure.  
 100. Recent sciatica helped by one suggestion. Cure.  
 101. Rebellious sciatica. Cure.  
 102. Rebellious sciatica. Gradual cure.  
 103. Neuralgia of trigeminus with facial ticdoloureux. Almost complete cure.

*J. Menstrual Troubles. 2.*

104. Menstrual retardation, suggestion of periods for fixed day. Success.  
 105. Profuse menstruation every 11 or 15 days. Interval lengthened by suggestion to 28 or 29 days.

It is necessary to call attention with greatest emphasis to the utterly wrong idea of hypnotism present in the popular mind. The average man conceives of hypnotism as a diabolical power possessed by a few favored individuals, by means of which they can do anything they please with any other individual who is unfortunate enough to come within their influence. Thanks to scientific investigations, we now know that hypnotism in its complete form is only a condition of sleep, which has been produced not in the ordinary manner, but at the suggestion of some person, and with the understanding that the one so put to sleep is to do whatever he is told to do. The hypnotizer has no power that the subject does not give him. He cannot carry out his command to sleep, unless the subject is willing. Even after the subject is asleep, he need not obey the commands if he does not wish to do so. Of course, if the subject believes that the operator has power over him, he will always obey.

Hypnosis, then, is nothing more than artificially suggested sleep. "Suggestion"—the term for which we are indebted to Braid, is the fundamental principle upon which this "occult" power depends. A great deal of discussion has arisen as to the nature of hypnosis, much of which has tended to mystify, and make it more terrible to the uninitiated.

For example, much stress has been laid upon the method of inducing hypnosis, in efforts to get at the cause as well as the nature of it. All these discussions neglect the principle of *Suggestion*. The method employed has nothing to do with the cause of hypnotism. It may be the condition in that particular case, but cause it is never.

The cause of hypnotism is in the fundamental relation of body and mind; the method of producing it is by suggestion. The suggestion may be accompanied by any circumstance that

the operator may desire. The fixed gaze has no more to do with causing hypnotism, than a couch has with causing sleep. Were it not for the suggestion, either understood and believed beforehand, or explicitly stated by the operator, "After you look steadily at this object, for a short time, you will fall asleep," the steady gaze would not produce hypnosis any more than folding the hands would. The hunter fixes his gaze on the distant game, sometimes for hours, without falling asleep, or into the first stage of hypnosis. He has never been given that suggestion. If it were an accepted fact or superstition, that if he looked too long he would become hypnotized, then we should have no end of such experiences. In hundreds of trades it is a workman's business to watch an object or a machine steadily for long intervals. The biologist looks steadily through microscope from early morning till late at night. All the conditions are precisely like hypnosis, except the suggestion, which is wanting. Animals can be hypnotized. But animals gaze at their prey by the hour without hypnosis.

On the other hand hypnosis is produced under all kinds of circumstances, so widely different that the only possible element common to all, is the suggestion or expectation. Braid showed that patients would go into hypnotic condition, if only they thought they were being hypnotized, whereas, if they did not know that they were being operated upon, the most skillful hypnotists could not have any effect upon them. Bernheim states this clearly. (See preface to last edition.)

Again, much confusion has arisen from confounding hypnosis with the effects of suggestion when in the hypnotic state. Catalepsy, *e. g.*, is a condition of muscular rigidity that can often be produced by further suggestion after the subject has become hypnotized. But the question in regard to catalepsy, is not "what is its relation to, or how is it produced by, hypnosis?" but only "how does the body become rigid in response to a command to do so?" This is also the question that we would be glad to answer in regard to disease; though at present we are more concerned with the facts as to how far the bodily conditions *are* changed in accordance with the command or suggestion of change.

One has only to think of dreaming—a dream where the stream of thought is directed by some person—to understand the condition of things in hypnosis. The characteristic thing about dreaming is that one does not question the reasonableness of the ideas that come into mind. This is also characteristic of hypnosis, and upon this depends its value in therapeutics. Whereas, in the normal condition, any suggestion is met by other considerations, and may be rejected; in dreams or in hypnosis, no opposing ideas are met, and the suggested idea



takes possession of the mind. When once the idea has possessed the mind, there is a tendency for it to work itself out into a physical expression. This is the power of suggestion, and the essential element in hypnosis and in all mental therapeutics, as we shall show later.

The power of suggestion is best explained by reference to the nature of mind, and the relation of body and mind. Given an idea in the mind<sup>1</sup> and it of necessity does one of two things: It arouses another idea, or it "generates its actuality," *i. e.*, it translates itself into motor terms. In lower life, this is all that can be done. This we call impulsive action. If we might assume in the *amœba* a consciousness, that stands to human consciousness somewhat as the *amœba* body stands to human body, then we might say that when an idea of movement arises in the consciousness of the *amœba*, its only possible effect or sequence is the translation of that idea into the actual motion. Not until we ascend to the top of the scale do we find that the aroused idea frees itself by arousing another idea. The very existence of animal life is dependent upon the sequence of idea by its motor equivalent. A sensation, a stimulus, gives rise to the idea—and this idea in turn discharges itself in motor form. Thus the needs of the animal are satisfied. Now the life of the species depends upon the perfection of this response, hence natural selection has developed this relation through all the life of the animal kingdom.

But the replacing of the motor consequent by another idea, could only happen after consciousness had so far developed as to hold one idea while another was being formed. A growth, so to speak, from one dimension to two. The *amœba* consciousness being spoken of as a consciousness of one dimension, while the other is two.

In man the idea is commonly followed by another idea and that one by another, and so on until such time as the nervous tension becomes so strong as to discharge into the motor areas, then the motor response appears. But the sequence of ideas being a far later development, is correspondingly weak. The idea of movement is met by an idea of rest, or of movement in another direction, or what not; the result is, no movement is made. If, however, no second idea meets the first, then the motor response occurs and the movement takes place.

Now in all forms of voluntary suggestibility the subject, of his own accord, tries to make the sequence always *ideo-motor*, never *ideo-idea*. In so far as he succeeds in carrying this out,

<sup>1</sup>This form of expression is used here and in other parts of this article, for brevity, merely, and does not imply an intellectualistic standpoint.

he becomes perfectly suggestible. In sleep opposing ideas are absent, hence hypnosis is the condition *par excellence* for suggestion.

#### APPLICATION OF THE FOREGOING THEORY TO MENTAL THERAPEUTICS.

We are now in a position to attempt a comprehensive explanation of all the forms of mental therapeutics.

It is an interesting fact that the adherents of any one form of "mind cure," say that all others are mere hypnotism. The Divine Healer thinks Christian Science is hypnotism; the Christian Scientist says Mental Science is hypnotism, and so through the whole list of rival schools. In the strict use of the word hypnotism, this is not true, since there is no "sleep condition" involved in any one of them. In every form with which we are acquainted, the patient is in full possession of his "wakened consciousness"—except in the avowed hypnotic treatment, and even here sleep is often very slight or even altogether wanting. Bernheim, Wetterstrand and others, often report "patient did not sleep" or "did not even close eyes;" and Dr. Parkyn declares that he prefers that his patients should not go into complete hypnosis—he thinks he gets better results without it.

In a scientific sense, however, it is true that *all* mental therapeutics is hypnotism, *i. e.*, it is suggestion. Suggestion is the bond of union between all the different methods, Divine Healing, Christian Science, Mental Science, etc. And the law of suggestion is the fundamental truth underlying all of them, and that upon which each has built its own superstructure of ignorance, superstition, or fanaticism.

Man is a creature of suggestion. The differences in men consist in the differences in the suggestions that they have received and the ways in which they have reacted to them. The ideo-motor man—the man who instantly translates every idea into a motor consequent, is but little above the brute; he is a vegetative being, and his form of reaction will suffice for his vegetative needs, if he is not made the victim of a designing reasoner. Exceptions to this, are those acts which were formerly considered, but now having been uniformly approved have become reflex or automatic, and mark a higher rather than a lower stage. On the other hand, the ideo-idea man—the one who inhibits the motor response, and follows the idea by another idea in rapid succession until such time as it is wise to follow with the motor expression—he is highest in the scale. Between these two we have all degrees. A Christian Scientist said to the writer, that the largest part of his work and his hardest work was to counteract the influence of hypnotism.

He was only expressing a general truth in mystical terms,—suggested by his belief in mysticism. What he really meant was that his hardest work was to counteract the effects of evil suggestion, and this is the experience of all who are trying to realize higher ideals.

It is because people will act upon suggestion without thinking that evil has entered into the world. And here we must note that the motor side follows the idea, not only voluntarily and consciously as when I follow the idea of striking, with an actual blow, but also involuntarily and unconsciously, as when the thought of nausea produces the muscular movements characteristic of vomiting, or the idea of an accelerated pulse is followed by an increased heart-beat, or the idea of a diseased kidney is followed by actual derangement of the functions of that organ, or the idea of health is followed by the perfect functioning of all organs. More will be said of this unconscious reaction, in a later section.

Confining, now, our consideration of suggestion to its relation to disease, we may note a law and the almost infinite number of ways in which it is brought into action. First, in the causation of disease: the idea of disease produces disease, in direct proportion to its definiteness, and in inverse proportion to the strength of the ideas opposing it. By the first clause we mean that a clear and definite idea of a specific derangement of an organ, will produce such derangement quicker than an indefinite idea that there is somewhere in the body a diseased organ. *E. g.*, Mr. C. has a clear control of his heart action; he has a definite idea of his heart, where it is, what it is, how it works, how to influence its working. Mr. G. has no such control, he cannot accelerate or retard his heart beat, he has only a vague idea of his heart. Now Mr. C.'s idea that he has heart disease, will produce that disease, much quicker than G.'s idea. By the second part, we mean, that an idea must become fully accepted, and actually possess the mind, with no possible sign of opposition, for it to produce its full effect. Manifestly, these are both ideal conditions, and upon that fact depends our safety. Otherwise every idea of disease would produce actual disease in our bodies. They are equally ideal, when we come to the application of the law of suggestion to the cure of disease, and upon that fact is based the fallacy of most of the schools of mental therapeutics—those that claim that all diseases can be cured, and in all persons.

Let us turn to the facts with regard to the causation or disease. There are not a few people to whom the mere mention of a disease is a suggestion that they are suffering from it, and with the result that pain and often symptoms of the disease appear. It is a well known fact that medical students

frequently suffer from the diseases of which they study. The vivid descriptions accompanied by pictures of the diseased parts, are sufficient suggestion to them to produce the motor response. We have already cited a remarkable case, of the physician who produced a serious duodenal catarrh (page 464).

The individual differences in this particular, while unexplained, are yet wide and of great importance. Some people are so constituted that the sight of a sprained ankle causes severe pain and lameness in their own ankle which has received no mechanical injury. The sight of a bleeding wound may cause a red scar, more or less permanent, and correspondingly located on the person of one of these sensitive observers. At the other end of the scale, we have those people who are in no way affected by the most unusual sights. And between these extremes are all gradations.

Now, while we cannot explain this peculiar "sensitive-ness," this physical sympathy, it nevertheless is a fact and cannot be ignored. It is manifestly absurd to include all these people in one category, or to expect the same results from the same methods with all people.

If it is true that suggestion can cause disease, as well as account for many other remarkable phenomena, we have paved the way for the next step,—the proof that suggestion cures disease,—for as Dr. Hall says, "if mind causes disease, it is reasonable to suppose that it can cure the diseases that it causes."

At least it will be important to trace the rôle of suggestion through the different forms of therapeutics. We shall find that it takes forms varying with the philosophy of those affected by it. Among primitive people, the mere similarity of a plant, *e. g.*, to the part of the body affected, was enough to suggest that the plant would cure the disease. Witness the doctrine of "signatures." As man developed in intelligence and in civilization, he outgrew this form and required a stronger suggestion. But the appeal was ever to the mysterious—to some force or power that was just beyond his understanding—and as his knowledge advanced, he continually pushed that upon which he pinned his faith, farther back into the unknown. And to-day the same idea is true. So that whether the treatment be with the idea that the gods are appeased by the swallowing of nasty compounds, or that certain objects in themselves possess the healing power, or God answers the prayer, or obedience to some transcendental law of mind brings health, the principle is the same. The unknown is powerful; mystery makes the suggestion all potent. Schrader and Schlatter are mysterious men. They talk little, dress peculiarly, and claim miraculous powers. Their claim is undoubtedly much enforced by their appearance, which is strikingly sug-

gestive of the Man of Nazareth—at least as the mediæval artists were accustomed to represent him. All these are elements that help make the suggestion acceptable, so that when they profess to heal any one, that person is strongly impressed, and easily rises to a condition of new and greater hope and effort.

In Mental Science the appeal is to "laws of mind" by which mental states not only control physical conditions, but have created all that there is of the physical, both good and bad. As it has created, so it can destroy. Both this and Divine Healing have an element in common that is a powerful factor in the accomplishment of the result. This is the part of the teaching which abstracts the patient from himself and fixes his attention on matters external to himself. Later we shall discuss this point more at length.

Finally, in hypnotism, we have the same appeal to mystery, though it takes various forms according to the intelligence of the subject. The individual who thinks hypnotism due to an odyllic force, is taking his mysticism in its most cras form. While the man who understands suggestion, and voluntarily accepts the suggestions of the operator and is cured of his disease, is still appealing to that ultimate mystery of the relation of body and mind.

We have now seen wherein lies the strength of the suggestion as it comes from the different sources, and we can see why each form has its followers. The objections that arise in the mind of any sick person, are overcome, now by one argument, and now by another. It must be borne in mind in all these cases, that a powerful aid to the acceptance of the suggestion is the longing of the individual for health. It is an observation of Cæsar's, that men easily believe what they wish to believe.

Healers like Bradley Newell appeal to another mysterious force—namely magnetism. The same thing occurs in the various patent curatives known as magnetic belts, etc., which as we have seen, are entirely free from any real electricity or magnetism, and owe their power solely to the expectation that they arouse in the mind of the patient.

Patent medicines appeal to the mysterious power of certain powerful drugs supposed to be contained in them. The suggestion is made potent by constant and continual reiteration through advertising. The pictures and testimonials constituting a suggestion that it is impossible for a certain class of minds to resist.

The quack doctor has much the same explanation. If he advertises in newspapers less, he makes it up by his own personality and his claims of great power, which he parades with an air of honesty and humility which easily catches the inexperienced in such ways.

The so-called Divine Healing makes its suggestions acceptable by an appeal to the deepest that is in man,—the religious instinct. With Bible in hand it requires only a little skill to make it appear that the Almighty is waiting to heal every ill that man ever endured, if only man will fulfill the conditions. Various passages of scripture are easily made to appear to declare all this, and so, many a devout person finds in these suggestions the means of rising to a supreme effort with an entirely new hope. The suggestion is freely accepted and has apparently free course to "generate its actuality."

But, as we have seen, although the suggestion is fully accepted, yet there are physical conditions that this tendency toward health cannot overcome in the short lifetime of an individual.

The law of suggestion in the *cure* of disease, may be stated as follows: The idea of health tends to produce health in proportion to the strength of the idea, or inversely as the opposition to be met. This opposition to the acceptance of the idea of health comes from the presence of other ideas or beliefs, and also from physical conditions which require, often, long time for their complete correction. The time required weakens the strength of the fixed idea.

The latter is the most serious difficulty to be met, and constitutes the weak point in all theories and practices of mental therapeutics. It appears that the different healers have become so fascinated by the heretofore unknown powers of the mind, that they have ignored the physical side, as having anything to do with the matter, other than to be passive and allow itself to be regenerated as the mind shall determine.

There are two lines of thought in this part of the subject: First we have the difficulty which comes from the actual absence of the necessary organs or tissues, to carry out the suggestion. A man without eyes may by argument, or in a moment of religious excitement, be led mentally to accept the suggestion that he will see. But not having the necessary organs for that purpose, he is physically incapable of carrying out the suggestion. Some healers claim that "mind" can and does create organs as they are needed. Proofs of this are wanting, but we must admit their argument that, this being a matter so contrary to all tradition, the mind has an unusual amount of prejudice to overcome, and examples that can be demonstrated are in the nature of things hardly to be expected. We do not know what might be accomplished if the mind were free to accept the suggestion without opposition. Nevertheless it is perfectly clear that there is one element omitted which negatives all the claims of the healers. Time is this neglected element. It may be true that every idea has a tendency to



"generate its actuality," even to a lost leg. But it must take time for that idea to work itself out. One may believe that if man set himself to grow wings, and willed it persistently for generations and ages, he would achieve his purpose. But when we come down to the lifetime of an individual, and that, too, when it is half gone, life is too short. The time element cannot be neglected.

A second point strikes deeper yet. It is the reaction of the diseased organ, or the effect of the loss of an organ, upon the mind itself. We cannot deny the fact of such influence. All the methods of mental cure assume a mind in fairly normal state, and they acknowledge themselves helpless unless the mind of the patient is in a condition to react intelligently to their suggestions. But we know that there are many conditions in which a person cannot so act. We also know that disease has its own effect upon the mind. We do not know the laws governing this matter, and we do not know what conditions of body make it impossible for the mind to accept suggestions that would be easily received under other circumstances.

It is only reasonable to assume that there may be many such conditions. Hence, in accepting a form of mental therapeutics, we may be holding a true theory, but making a sad mistake by attempting to apply it under conditions that it does not fit.

We come now to the question of suggestibility from another standpoint. It also bears upon the matter just discussed and will help to make our conclusions clear. We have admitted that if patients could fully accept the suggestions of the healer, there might be more decided results. The thousand and one prejudices, questionings, etc., etc., keep the individual from giving himself up entirely to the idea that he thinks he accepts. We have, however, one class of data where the ideal condition seems reached in a measure. We refer to the hypnotic cures. Here the reasoning faculty being in abeyance, questionings or prejudices are much weakened or entirely excluded. In fact, it is the unanimous consensus, that the one characteristic of the hypnotic condition is that of accepting, with little or no question, whatever is suggested.

The following table compiled from 414 cases of Drs. Van Rhensterghem and Van Eeden, shows clearly that (1) the deeper the hypnosis the larger the percentage of cures. (2.) Even in the deepest hypnosis, not all cases were cured—even of those that were tried. (3.) Some classes of diseases are far less amenable than others.

The inferences from this table are extremely important, and help to answer several practical questions.

The first point referred to—that the deeper the degree of



hypnosis, the greater the therapeutic effect—may be elucidated by the following illustration :

## RECORD OF 414 CASES OF HYPNOTIC TREATMENT.

## A.—Diseases of the Nervous System.

## B.—Other Diseases.

EFFECT OF TREATMENT.	Organic diseases.			Severe Neuroses.			Mental disease.			Neuropathic.			Functional Internal.			Functional External.			Total.						
	Total.			Total.			Total.			Total.			Total.			Total.									
	A.	B.	C.	A.	B.	C.	A.	B.	C.	A.	B.	C.	A.	B.	C.	A.	B.	C.							
No effect,	6	3	0	10	0	1	1	3	11	2	0	16	28	3	0	32	1	1	2	4	3	7	71	20	
Slight or temporary benefit,	6	1	1	8	6	7	0	13	10	3	0	13	35	12	3	50	2	3	1	6	2	2	92	26	
Permanent or decided amelioration	1	2	5	4	4	3	11	6	6	2	14	26	27	3	56	2	5	1	8	4	4	4	98	27	
Cure,	0	1	0	1	3	1	5	9	6	2	2	10	22	23	18	64	0	6	1	7	3	1	4	100	28
Unknown,	5	0	0	5	1	1	1	3	4	1	0	7	21	6	0	31	4	—	—	—	—	—	53	1	
Totals,	18	7	3	29	14	14	10	39	37	14	46	132	71	24	233	9	15	3	27	7	10	17	—	—	

13 cases in which hypnosis could not be induced were divided as follows:—1, organic disease, no effect: 1, severe neurosis, no effect: 5, mental disease, 3 no effect, 2 unknown; 6, neuropathic, 1 no effect, 4 unknown, 1 cure.

Also 1 case fever, "A," no effect. 1 anaesthesia, "C," cured. 7 dysmenorrhea, 1 "A," 3 "B," 2 "C," all cured. These are included in the respective totals.

A—Light Sleep.

B—Deep Sleep.

C—Somnambulism.

4 went into the deeper forms of hypnosis; of the 50 slightly benefited, 15 went into the deeper states ("B" or "C"); of 56 showing decided improvement, 30 went into the deeper hypnosis; and of the 64 cured, 41 went into deep sleep or somnambulism. The deeper the hypnosis the less the opposition to the suggestion of the operator; and the less the opposition, the more likely that the suggestion will produce the desired effect,—health.

This fact that the percentage of cures is greater in deeper hypnosis than in light, shows the difficulty in ordinary practice of overcoming the patient's objections or the unconscious counter-suggestions that constantly rise from the ideational centers.

A second point clears up a difficulty that we have already met in considering the claims of Christian Science. We have seen that while they admit failure to cure all diseases at present, they yet claim that the more perfect development of the individual in the new thought, the more complete acceptance of the suggestion, will accomplish the cure of all disease. But in hypnosis, we seem to have a state that is ideal, so far as the absence of distracting prejudices are concerned. The demand of the Christian Scientist for a test under conditions of complete acceptance of the teaching, seems here granted and with a negative outcome that all diseases are not cured. Not even are all cases of the same disease cured. Even those most skilled in pathology and in hypnotism cannot tell beforehand what case can be cured by the treatment. This seems to be conclusive proof that Suggestive Therapeutics must take its place by the side of drugs rather than to assume to supersede them.

The third inference corroborates this idea. Some classes of disease are, as a rule, cured by suggestive treatment; others are, as a rule, not affected.

It must be admitted at this point that hypnotism itself is not at its perfection yet. The operators are still more or less bound by tradition, and the belief that certain ailments cannot be cured. This belief they unconsciously communicate to their subjects. But in view of all the facts, it is altogether improbable that the results can be materially changed. The line of division between curable and incurable cases may be somewhat changed so as to put a few more on the curable side; but there is nothing to indicate that the claim of Christian Science can ever be realized. On the other hand, much in the nature of mind and of body, as well as what we know of their relations, points clearly to the other view.

## PSYCHOLOGICAL PROBLEMS.

The facts of special interest to psychological science, which stand out from the preceding pages, and which require some further discussion, are three:

First. Pain *ceases* in accordance with these methods of treatment.

Second. Changes in tissues of the body are produced in accordance with the mental condition.

Third. The mental attitude of patients at all stages—before and after and during the cure—is one best described in terms of belief, or more explicitly, in terms of attention as modified and controlled by more or less conscious beliefs. Before the cure, the patient thinks about, and attends to, his pains and symptoms; in his cure, he ceases to attend to these, either neglecting them entirely, or attending wholly to the sensations of improvement that he is led to look for. After his cure, if it is permanent, his attention is directed outward, to normal human interests and the daily affairs of life.

Two questions arise in connection with these facts, viz.: What is pain that it thus appears and disappears with the fluctuation of the attention? and how does a mental state affect changes in body tissues? To propose to answer these questions would be the height of presumption, but we may be permitted to add a little to the speculation already extant. Although pain-pleasure has been extensively discussed, and many theories advanced, we seem to be still far from agreement on the main question of what pain is or its physiological basis. Whether there are special, pain nerves, end organs or brain centres, is a matter of dispute. Wedinski thinks all nerve fibres can feel pain; Fick says pain is mostly in the spinal cord; Wernicke declares that all basal centers with gray matter in them can ache. Eddinger makes the internal capsule the pain center; Ludwig claims that he cut out certain parts of the spinal cord and destroyed pain in certain regions.

Marshal (Pain Pleasure and Aesthetics, N. Y., 1894, p. 204-5) says:

"Whence we have the working hypothesis:

"(1) Pleasure is experienced whenever the physical activity coincident with the psychic state to which the pleasure is attached involves the use of surplus stored force—the resolution of surplus potential into active energy; or, in other words, whenever the energy involved in the reaction to a stimulus is greater in amount than the energy which the stimulus habitually calls forth.

"(2) Pain is experienced whenever the physical action which determines the content is so related to the supply of nutriment

to its organ that the energy involved in the reaction to the stimulus is less in amount than the energy which the stimulus habitually calls forth.

"In general we may also say that:

"Pleasure and pain are primitive qualities of psychic states which are determined by the relation between activity and capacity in the organs, the activities of which are concomitants of the psychoses involved."

Witmer, in what is probably the best paper that has appeared on the subject, of recent date, summarizes as follows: (See "Pain" by Lightner Witmer, in 20th Century Practice of Medicine, Vol. XI.)

1. Pain is a simple unanalyzable mental content.
2. It should therefore be called a sensation.
3. There is no conclusive anatomical evidence for the existence of a peripheral sense organ or nervous end organ for pain.
4. Nor for pain nerves or peripheral sensory neurons.
5. Much evidence justifies the conclusion that all or some peripheral nerves may under adequate stimulation, act with specific pain-producing function; that such nerves may lose their function without a loss of other functions or may lose other functions without losing the pain function. Thus pain may be a sensation of purely central nervous origin. The arousal of pain by stimuli and its presentation in consciousness along with other sensations, may be explained by the simultaneous association of pain with other forms of stimulation—an association that may take place at any level of the nervous system. (Analogous to colored sound.)
6. There is a specialized pain tract in the spinal cord which is certainly constituted in part of the gray column, and which may be composed of a part of the gray column of both sides, including the commissure and a part of the lateral tract. Into this pain tract nerves from the sympathetic system and from the internal organs, together with all specialized nerves from the periphery, discharge their stimulation when this is relatively intense. The intensity necessary to bring about this discharge may be that which is sufficient to overcome the resistance offered by the tract.
7. This tract passes up through the optic thalamus and posterior limb of the internal capsule, the "carrefour sensitif," into the cerebrum, and reaches some region unknown, but probably a part of the somæsthetic area. This hypothetical area may be looked upon as the pain center.
8. There is some warrant or justification for considering the pain tract in the spinal cord as the specialized nerve organ of pain, which together with the hypothetical specialized cortical center constitutes the specific organ of pain.

9. Any part of this central pain organ may be stimulated in the cortex or below it, either by stimuli discharging into it through normal physiological processes, by spinal or cortical association, by irritation due to disease, and perhaps by a vascular disturbance within the central nervous system.

Grant Allen (*Physiological Æsthetics*, N. Y., 1877,) says:

"Pain is the subjective concomitant of destructive action or insufficient nutrition in any sentient tissue. Pleasure is the subjective concomitant of the normal amount of function in any such tissue." (p. 29.)

But neither of these definitions recognizes the effect of attention on pain. This is perhaps due to the general idea that attention only effects the degree to which the pain is felt. It is of course a common experience that one feels their pain more when they give attention to it, whereas anything that can distract attention lessens the painful sensation. But this is only a part of the truth. The fact is clearly proved by the experiences of mental therapeutics, that the sensation of pain is absolutely removed by these methods which focus the attention on some extraneous object or idea. This accounts for the many supposed cures, which prove not to be permanent—pain is stopped, and since pain is the chief objective sign of disease, patient thinks he is entirely cured. If this is not the case, then we have to account for the actual change of the tissue from disease to healthy condition, in such a remarkably short time that the healers call it instantaneous.

Toward an explanation of these facts, may we not assume an hypothesis something like the following?

Every cell of the body has its own sensibility, and reacts to stimuli in a certain definite way if the stimulus is helpful and the opposite way if the stimulus is harmful. If we think of a primitive unicellular organism, we can easily imagine that in time, these two reactions would become distinguished, and consciously pleasurable and painful respectively, according as they were beneficial or injurious to the life of the organism. Then as we ascend to the multicellular organ and differentiation begins, one cell devoted to one kind of work and another to another kind, the liability to injury is increased, and the power of resistance is reduced, since the cell having developed greater efficiency in one direction has given up its power in another.

But here a new element comes in. The very fact of the associating together of different cells necessitates a kind of rough acquaintanceship. Each cell in the association must be stimulated by the cell adjoining it in a way that is neither the stimulus of a food particle nor yet an enemy. The recog-

nition of this difference in stimuli is the beginning of consciousness, or if Cope's view of archæstheticism, or primitive consciousness of the individual cell is correct, then we shall call this consciousness which recognizes adjacent cells as part of the same organism, the "general consciousness" in accordance with Stanley's terminology. The extent and importance of this general consciousness increases as we ascend the scale of life. When we reach the rudiments of a nervous system, this general consciousness takes a controlling interest in the corporation, and psychic life begins in earnest.

Henceforth we have a well regulated plan. We may liken the organism to a republic composed of individual states. The general government is concerned with the welfare and reputation of the body as a whole; each state—or cell—attends to its own affairs, does the work that has fallen to its lot, and settles its own difficulties as far as possible. When, however, the difficulty becomes too great, an appeal is made to the general government.

Now, in this multicellular organism, trouble is constantly arising; every cell is constantly receiving unpleasant stimuli and experiencing pain because of its own sensibility. Whether this cell-consciousness of pain will rise to the general consciousness, seems to depend upon two factors: first, the quality and quantity of the pain consciousness of the cell, and secondly, the amount of attention given to it by the general consciousness—to revert to our figure, whether the general government will become interested in a state trouble, depends upon the magnitude of the trouble and the amount of business the general government has on hand. Experience shows that we have all degrees, and every possible circumstance. We may give our attention to almost any organ of the body and in a short time we can find pain there. Normally it is highly probable that much that is pain for the individual cell or group of cells, passes without ever coming to full consciousness.

Finally, attention may be turned away from the cell group and strongly fixed on some extraneous object or idea, and then a pain of high intensity and involving a large area may fail to make itself felt. Instances are seen where a person suffers a severe injury, even a fatal wound, but under excitement feels no pain and is even ignorant of what has happened.

It seems reasonable that the second of the conditions enumerated should be the one most in accord with the highest welfare of the organism, especially if we are considering an intelligent being. Whenever an injury is of such a nature or extent as to endanger the life or efficiency of the organism, the attention of the entire being must be turned towards its

restoration. When, however, the intelligence has done all that can be done to remove the trouble, consciousness may and should be diverted in other directions, since, as Dr. Leach says: ("Albrutt's System of Medicine," p. 241,) "Pain and suffering, by their influence on nutritional processes, tend directly to prevent the return of tissues and organs to normal state;" or, as Dr. Edes puts it, "Attention constantly turned in on its own painful surroundings impedes healthy mental action as an ingrowing toe nail impedes healthy locomotion." (Edes—Shattuck Lecture 1895. p. 37.) Similarly, any injury of any less extent than this, need not, and in the best regulated organism must not, come to consciousness. And finally the absence of pain in the case of serious injury is a calamity which would in time destroy the species.

In mental therapeutics, the intelligence is appealed to, to do precisely what we have just seen is the wisest thing. In different ways the patient is induced to fix his attention on some idea other than his pain. He does this the easier from the conviction that he is in the care of those who are seeking his welfare. The Christian Scientist tells him he has no pain, and so distracts his attention by convincing him that there is nothing there to fix his attention on.

In hypnotism, again, the attention of the patient is fixed, perhaps, on the supposed power of the operator; finally, in Divine Healing, the patient fixes his attention on the Creator "who healeth all thy diseases."

The relation of the nervous system to this process is obvious. This higher consciousness is an immense advantage to the animal possessing it. But it is only possible where all the parts are so related that the cell consciousness of one part can be communicated to another part. In the lowest multicellular animals this is easily accomplished by simple contact. But as we go higher this was not sufficient, and those animals that had no better plan died. Those who could provide a line of easier conduction would survive. Thus may have arisen the nervous system which makes possible the interchange of cell-consciousness throughout the body. The place of transfer or for collecting all the sensations, is the central nervous system. And, as all kinds of combinations are possible here, so we have all possible degrees of consciousness resulting. Perhaps the simplest is the reflex arc of the spinal cord, which is commonly supposed to be unconscious. Then come the reflexes from the lower levels of the brain, giving rise to a greater or less degree of consciousness. The most complete combination of all the incoming sensations constitutes full consciousness. This has to do with the highest welfare of the individual. Health and the highest efficiency is obtained when this total



consciousness is made up of sensations, each of which has its full value, and no one of which occupies a larger place in consciousness than it deserves. Under such circumstances, any cell or group of cells comprising tissues or organs, whose derangement endangers the whole body, will be at once attended to, and the higher faculties of the mind brought to bear, to restore the diseased parts to normal condition; on the other hand any pain which arises from a purely local trouble will be neglected and allowed to take care of itself.

Such a theory as this assumes nothing inconsistent with known facts, and at least gives a possible explanation of the matter in question.

In concluding this part of the discussion we may quote from Stanley (*Evolutionary Psychology of Feeling*, p. 32-4.):

"The earliest living aggregations attain but a very slight degree of common life, and very slowly do the cells, under the pressure of serviceability in the struggle for existence, give up their independence and become interdependent, each thereby giving up some functioning to be done for it by others, and in turn functioning for others. Thus it is but slowly that a stomach is specialized, the cells in general in the organism long retaining and exercising some digestive function, which is properly termed sub-digestion. In this way a soup bath gives nourishment. If psychic function specializes gradually like other functions, we shall have in the same way a sub-form here, a sub-consciousness which stands for lower centers, and not for the whole organism as such. The wider, higher, and more specialized psychic center does not at once extinguish the lower.

"Now what is a *higher* organism but an involved series of combinations of combinations? With every new integration a higher plane is achieved, and the vital process has a wider functioning; but the psychical activity so far as it does not pass over into the service of the new and higher whole, remains as sub-function. With every new stage in evolution the integrating psychic factors only partially lose themselves in effecting a common psychism for the new whole, a sub-consciousness and a sub-sub-consciousness etc., are still carried on in survival. In man, physiologically speaking, it is the brain consciousness which is general. But we need not suppose this to extinguish all the lower ganglionic consciousness from which and by which it arose. If psychic function be correlative with other function, we must expect in man a vast amount of survival sub-mentality which, while not the mind of the man, is yet mind in the man. The individual knows necessarily only the general consciousness, for this only is his consciousness and constitutes his individuality, yet the doctrine of evolution would call for a vast deal of undiscoverable simple consciousness which never rises to the level of the whole organism's consciousness. A cell or a group of cells may be in pain and yet there be no pain in the individual's consciousness, and so unknown to this general consciousness.

"We have intimated that primitive consciousness may occur in a sub-conscious way in the highest organisms. But can this sub-consciousness ever be more than mere survival in its nature? or may it play essential part as basis of higher manifestations? If the integration of mentality is like other integration, *e. g.*,—material which is based on molecular and atomic activity—it will be bound up in the activity

of psychic units, which can be none other than sub-consciousness. That is, any common or general consciousness when looked at from below, and analytically is the dynamic organic whole of elements; it is a product of activities which are on another plane from itself. Roughly illustrated, I may say that my finger feels pain before I do. We conceive that at a certain intensity a sub-consciousness tends to rouse a general consciousness, and for a time maintain it; and losing intensity, the general consciousness disappears, leaving only the sub-consciousness, which may long outlast the general form.

"Sub-consciousness, whether as survival or basal, is put beyond our direct observation, but it remains a necessary biological and psychological hypothesis."

I have quoted somewhat at length, because of its bearing on the next section as well as on the preceding.

We may now proceed to discuss our second question: How can a physical change be effected, in correspondence to a mental change?

For convenience we may note that physical changes in the human body in its relation to health are wrought in four different ways.

First we have the voluntary changes. If eyes are painful, one closes the lids and shuts out the light. If an arm or a leg is the seat of pain, a change in its position may relieve it. We rest or we exercise a muscle or organ as we will, according to its condition or the condition we wish to produce. With the aid of the surgeon we remove diseased parts. All this is familiar, and while we really know nothing of how a movement is accomplished by the will to move, yet we are satisfied to leave that question and hide our ignorance under the sound of psychological terms.

Secondly, we apply drugs to the system, and by chemical or mechanical or molecular action produce changes in the condition of the system or some part of it. All this is every-day therapy.

Thirdly, we have shown in the preceding pages that outside of the voluntary muscles, and without any drugs, the physical condition is changed according to some law of mind, little understood, but roughly expressed in the formula, "believe you are well and health results." As we have already seen, a large part of this work is sufficiently explained, by the simple removal of worry or the distraction of the attention from the disease. We need not go into a discussion of the question: why too much attention to an organ is unfavorable to its functioning, and the dissipation of attention favors recovery. Indeed we cannot discuss it without a fuller exploiting of attention than is fitting here. It is sufficient to point out that such is the case—a fact which all will recognize—and to remark in passing that it seems most likely to be a relaxation of muscular as well as a mental attitude.

The result of attention to an organ is an unconscious muscular contraction which necessarily interferes, as a rule, with the normal functioning. The withdrawal of attention relaxes the muscles and allows normal action and nutrition.

The fourth class is made up of those cases of mental effect where the simple removal or relaxation of attention does not seem to account for the result. These are best seen in hypnotic cures, where, in accordance with the suggestion of the operator, a physical change is wrought unconsciously to the patient, such as the acceleration or retardation of the pulse; the raising or lowering of temperature, etc.

This class seems to demand the aid of some hypothesis of the unconscious or sub-conscious control of physical states by mental activity. Something akin to volition, but which is unconscious, would seem to be necessary to account for the facts. It is as though while we cannot get direct control of the heart, *e. g.*, and stop its beat or increase its rate, yet we can convey a message to some power within us, but of which we are unconscious, and this power accomplishes the desired result. This is the idea of Mr. Myers's Subliminal Consciousness Theory (P. S. P. R. Vol. VII, pp. 345-6), in which he argues for an unconscious *intelligence*, which directs the action of the involuntary muscles, just as a man directs his voluntary muscles.

This is not the place to discuss the different views of the unconscious; the reader can consult Hartmann, Cope, Clifford, Waldstein, Lewes, Stanley, and others who have written on it.

That consciousness holds only a small part of man's mental stock, is recognized by all psychologists; also that evolution gives good reason for all grades and degrees of consciousness. Perhaps Myers's statement sums this up as well as any. He says (*loc. cit.*) :

"We may regard the human organism as an aggregation of primitive unicellular organisms, which have divided their functions and complicated their union, in response to the demands of the environment and along such lines of evolution as were possible to the original germ. It is possible, too, that all these processes—beginning with the amœboid movements of the primitive cells—were accompanied by a capacity for retaining the impress of previous excitations, a rudimentary memory which at first constituted all the consciousness which our lowly ancestors possessed. And further—may we not suggest—as evolution went on and more complex operations were developed while the primitive processes of cell change became stereotyped by long heredity, the memory which represented these earlier changes sank to a low psychical depth; became subliminal and

could no longer be summoned by a voluntary effort into the *super-liminal* sequence of conscious states. How do we know that any psychical acquisition is ever wholly lost? or even that a memory is the weaker because it has sunk out of voluntary control? It may be possible by appropriate artifices to recall primeval memories and to set in motion any physiological process which could at any moment of our ancestral history have been purposively, however blindly, performed."

This seems to be the line along which we must look for our explanation, and yet in the hypothesis of Myers there seems to be a flavor of mysticism which is not entirely satisfactory and not easy to comprehend.

May we not describe the whole process as follows?

It is a quite generally accepted theory now, that all reflexes were once conscious but have lost the conscious element through repetition and ease of performance; consciousness itself being dependent upon a sense of effort, when the thing is done without effort consciousness must necessarily vanish. This is on the physical side, and the motor phase. But when any given act was conscious, there was not only a definite movement of certain muscles, whose efforts to move gave rise to consciousness, but there was a definite nervous discharge in the cells of the nervous system. The volition which caused the movement had its concomitant physical element somewhere in the brain or spinal cord. This whole mechanism was set off by a conscious state of will, or an idea. Now, when the movement became automatic or reflex, what became of the brain path which had been worn by generations of conscious effort? Is it not possible that they too remain, not, indeed, as the well worn trails that they were when this particular movement was a conscious movement, but yet they remain distinctly different from the parts where no such paths have ever existed? They are like the old wood roads of a past generation, often noticed in the forest; no longer used, much overgrown, but still recognizable as the place of a former thoroughfare, and still the route that would be picked out if a new road were to be constructed for the same purpose. May it not be that the new volition which finds no conscious outlet for its energy, nevertheless finds an outlet along this old course, so slowly indeed that it gives us no consciousness of the fact, but nevertheless it reaches the same muscles and accomplishes the same result that the old volition used to do? Like the traveller who returns to his native city after long years of wandering, and finds nothing recognizable as he goes along the streets, cannot even tell the direction of his old home, and yet all unconsciously to himself he walks in the

right direction, makes the proper turns, and arrives at the very house he used to call home.

We do not know how to influence the action of the bowels directly, but the simple organism which was our remote ancestor, knew all about it, because his whole consciousness was occupied with that function, and whenever it was necessary to get rid of the waste products, he went about it just as we take a bath. And the traces of the old act are with us, since it is only necessary for us to fix our attention on the desired movement, and somehow, altogether without our knowledge, the desired result follows—the volition has found its way through the old, overgrown path.

Thus, it seems to us, we may picture to ourselves the way in which an idea generates its actuality without doing violence to any known facts, and without calling in the aid of any power more mysterious than primitive consciousness.

Dr. Edes says, in this connection (New England Invalid, p. 53.):

"It appears necessary that the influence which is to promote such a psychic change as must take place in cases of hysteria, and consequently in many of chronic invalidism, that which is to make the cerebral hemispheres again resume their control of the muscles, which is not merely to diminish the extreme sensitiveness to pain and fatigue, but inhibit that active search for it so commonly seen; that which is to set flowing again that nervous current which promotes nutrition; in a word, that influence which cures, whether in the hands of the physician who has studied the case and who knows it scientifically, or of the charlatan who makes no pretense to such knowledge or shrewdly guesses at it from the failures of his predecessors, must reach that psychical region that is not in full view of the ordinary consciousness, the so-called subliminal consciousness.

"It is apparently in some lower stratum of cerebral action that intellectual convictions are moulded into confidence, desire and activity, and there also apparently the same convictions may arise without the intervention of distinct perception or logical reasoning. There are those who hold that this region may be reached most quickly and certainly through hypnotism, *i. e.*, the patient is made more receptive and suggestible thereby. We have seen how it is reached by methods which have but little to do with the reason, and much with mystery and marvel. It is certain, however, that these are not the *only* channels through which an impression can be made, and it seems probable that when the physician, by beginning with the ordinary consciousness and by oft-repeated direction and encouragement, sometimes amounting to a re-education, can stimulate the motor powers of the will

and set them free from the inhibitory control of fear, habit, and hypochondriacal delusions, the result is quite as complete and permanent a one."

#### RÉSUMÉ AND CONCLUSIONS.

We have seen in the foregoing pages, that the psychical element is large in the cause of disease; that it played a prominent part in primitive and folk medicine; that it is the sole element in the so-called Divine Healing, after excluding all cases where some form of simple therapeutics might account for the cure; the same is true of Christian Science, Mental Science, hypnotism, and a certain amount of "regular" medical practice; the same element enters largely into patent medicine, patent devices, fads, and so through a long and ever increasing list. We have found all these alike in principle and all depending upon a fundamental relation of body and mind. This we have found best studied is hypnotism. From this study we have designated that "fundamental relation," by the familiar term "suggestion." And lastly we have attempted to review known facts with a hope of correlating our data more closely.

The conclusion from all this is that while the mind plays a large rôle in the cure of disease—greater than is realized—yet its greatest field is in the realm of prevention. Christian Science, Divine Healing, or Mental Science do not and never can in the very nature of things, cure all diseases; nevertheless the practical applications of the general principles of the broadest mental science, will tend to prevent disease.

Secondly we find nothing in the nature of mind or body, nothing essential in Mental Science, that is incompatible with drug therapeutics as such. We find no good reason why the two systems should not go on together. Indeed the solution of the present condition of rivalry seems to be a close alliance,—each helping the other.

While we find nothing to warrant the overthrow of the science of medicine, and no power that is able adequately to take the place of a thorough knowledge of anatomy and pathology or the skill of the surgeon, we do find sufficient evidence to convince us that the proper reform in mental attitude would relieve many a sufferer of ills that the ordinary physician cannot touch; would even delay the approach of death to many a victim beyond the power of absolute cure, and the faithful adherence to a truer philosophy of life, will keep many a man well and give the doctor time to study his science, and devote himself to the alleviating ills that are unpreventable.

Of Christian Science philosophy we find no justification in any of its *distinctive* features. The special features that



characterize it are in violent opposition to all that, in the light of history and present knowledge, the highest intelligences as well as the *vox populi*, regard as the truest philosophy and the best theology.

What Christian Science has in common with Mental Science, constitutes its sole claim to regard. Mental Science in turn, owes its value to its effort to make practical and bring within the reach of all, the best idealism of heathen philosophy and the Christian religion. So far it is worthy of all praise, help, and encouragement. But in this effort success has already attended it to such an extent that, lacking in scientific analysis, it has built up some erroneous theories which must eventually be sloughed off. Such is the whole theory and practice of absent treatments, in so far as it involves thought transference. Whether telepathy be true or not we do not pretend to say ; but we can say that we have found no evidence of it in any of the data that we have examined, and we thoroughly believe that every case where it is assumed, will be found to be either coincidence or the result of auto-suggestion.

There are also other notions which are too crude to last long, and which only characterize the infancy of the theory. But aside from these, Mental Science or the "New Thought," as some of its adherents now call it, seems to teach a sound philosophy and much practical sense in regard to therapeutics. It certainly can do the world no harm to have a body of people devoting themselves to emphasizing the mental side of life in these days of materialism. Indeed, so far as we are able to judge, the whole movement, as represented by the best of its promoters, is healthy and safe. And it is only when it is carried into absurdities that it becomes dangerous.

The fundamental principle of all mental therapeutics is the law of suggestion—the law that any idea possessing the mind tends to materialize itself in the body. Hypnotization is the idea of sleep, which has thus materialized itself, so that the subject sleeps. While in this hypnotic sleep the subject easily accepts further suggestion since his reason no longer opposes the suggested idea. The idea of health, which is then suggested, tends to be realized. This *tendency* which is admitted, is to be carefully distinguished from the *actual effect* claimed by the healers.

In Divine Healing, Christian Science, and other forms of mental healing, the reasoning which would oppose the suggestion is silenced, not by sleep, but by some powerful argument, dogma or assertion of the healer. If the patient accepts the teaching of the healer, without question, then the ideas which the healer suggests tend to work themselves out. And, as far as that healer is concerned, the patient is in a state



analogous to that of the hypnotic subject, though in all other respects he may be wide awake.

In both hypnotism and Christian Science it is the *fixed idea* in the mind of the *patient*—placed there by the healer or operator, or suggested by a book or elaborated by the patient's own reasoning—that accomplishes the result through its tendency to "generate its actuality."

In hypnotism we find no occultism, but rather a practice making use of perfectly natural laws and having its legitimate place in therapeutics. It is perfectly harmless, and the only possible danger from it comes from ignorance of its nature.

Finally, Divine Healing, as commonly understood, has no foundation for its theory. Not only are all its results readily accounted for by the laws of mind, but its results are not as great as those of the avowed mental healer.

The theory of Divine Healing is, if we mistake not, a positive perversion of religion. Nothing is more strongly shown by our study, than that the most striking and most successful cures are wrought by drawing the patient out from himself and his disease and fixing his attention on things higher and beyond himself. The thought that is fixed on another's interests is removed from one's own diseases, and the organs thus freed from attention have a chance to recover. Do not dwell on your ills, is the key note of it all. This is the truth which Mrs. Eddy has so travestied in her doctrine that sin and disease do not exist.

Now this altruism, which is thus seen to be the gist of all mental healing, is the very essence of Christianity. Religion has in it all there is in mental therapeutics, and has it in its best form. It teaches temperance in the broadest sense, high ideals and dependence upon the Highest alone. This preserves those who know it, by practice as well as by precept, from most of the ills that make up the list of those curable by mental methods. But further, it teaches a wise submission to the inevitable, a freedom from care and worry and the spirit of hopefulness. And these are the exact conditions aimed at by all mental practices. Living up to these ideas will do everything for us that can be done.

The state of mind has a powerful influence over the body, both for the cause and the cure of disease. Lofty thoughts, high ideals, and hopeful disposition, are able to cure many diseases, to assist recovery in all curable cases, and retard dissolution in all others.

Whatever the fundamental relation of mind and body may be, the aim of all conscious effort relative to physical well-being, should be to become unconscious of the organic life and its functioning.

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To persons outside of the University, an acknowledgment is also due, but they are too numerous to be mentioned by name. Physicians, clergymen, "Healers," and patients have been uniformly kind and courteous, and have freely contributed the data, without which the study would have been impossible. To them, one and all, I desire to express my thanks.

## THE PSYCHOLOGY OF A PROTOZOAN.

By H. S. JENNINGS.

The nature of the psychic activities of unicellular organisms has of late become the object of considerable interest, though little work dealing with the problems in a fundamental way has been published since the researches of Verworn. The writer has recently made a perhaps more thorough study of the life activities of a typical infusorian, *Paramecium*, than has ever been made heretofore of any unicellular organism; the results of this study have been published in a number of papers in physiological journals.<sup>1</sup> This work was not done primarily from the psychological standpoint, and the papers referred to give nowhere a full and connected account of the bearings of these studies upon the psychological problems presented by the behaviour of the *Paramecia*. Yet taken together they enable an almost complete presentation to be given of the psychology of this animal; while there is reason to believe that *Paramecium* is in this matter typical of nearly or quite the whole class to which it belongs. In the present paper an attempt is made to bring together succinctly the observations which bear upon the psychic powers of this organism, in such a way as to present a complete outline of its psychology.

*Paramecium* is well known in every biological laboratory, living by thousands in pond water containing decaying vegetable matter. It is a somewhat cigar-shaped creature, about one-fifth of a millimeter in length, plainly visible to the naked eye as an elongated whitish speck. The entire surface of the animal is covered with cilia, by means of which it is in almost constant motion.

Now what are the phenomena in the life of *Paramecium* which require explanation from a psychological standpoint?

Examination shows that under normal conditions *Paramecia*

<sup>1</sup> Studies on Reactions to Stimuli in Unicellular Organisms. I. Reactions to Chemical, Osmotic, and Mechanical Stimuli in the Ciliate Infusoria. *Journal of Physiology*, May, 1897, Vol. XXI, pp. 258-322. II. The Mechanism of the Motor Reactions of *Paramecium*. *American Journal of Physiology*, May, 1899, Vol. II, pp. 311-341. III. Reactions to Localized Stimuli in *Spirostomum* and *Stentor*. *American Naturalist*, May, 1899, Vol. XXXIII, pp. 373-389. IV. Laws of Chemotaxis in *Paramecium*. *American Journal of Physiology*, May, 1899, Vol. II, pp. 355-379.

are usually engaged in feeding upon the masses of Bacteria which form a thick zoogloea on the surface of the water in which they are found. These Bacteria form almost or quite their entire food. A first question then might be: How do they choose their food, selecting Bacteria in preference to something else?

If *Paramecia* are placed on an ordinary slide such as is used for examining objects with the microscope, together with a small bit of bacterial zoogloea, and the whole covered with a cover-glass, it will soon be found that almost all the *Paramecia*, which were at first scattered throughout the preparation, have gathered closely about the mass of zoogloea and are feeding upon it. It will be seen even, that many *Paramecia* which cannot on account of the crowd get near enough to the mass to touch it are pushing close and shoving their more fortunate brethren, all apparently trying to get as near to the delicacy as possible. Some may be ten times their own length from the mass, but nevertheless crowd in from behind, apparently with the greatest eagerness. Here we have a related problem. How do the *Paramecia* collect thus from a distance about the mass? And what is the psychology of their crowding together thus, like a human crowd about a circus door? In the human crowd somewhat complex psychological qualities are involved; must we say the same for the *Paramecia*?

If we mount the *Paramecia* in the manner above described, but without the mass of bacterial zoogloea, we shall soon notice another phenomenon reminding us of human beings under like conditions. The *Paramecia* do not remain scattered as at first, but soon begin to collect into assemblages in one or more regions. It appears as if they did not enjoy being alone and had passed the word along to gather and hold a mass meeting in some part of the preparation; at least we soon find them nearly all in a little area near one end of the slide, with perhaps another smaller crowd off near the other end, while all the rest of the space is empty. Sometimes such a crowd becomes very dense; the *Paramecia* jam each other after the most approved human fashion, crowding as if all were trying to get near some popular orator in the center. If we watch such an assembly for some time, we find that the interest is apparently gradually lost; the *Paramecia* begin to separate a little,—not leaving the crowd entirely, but extending the area and wandering about its edges. The assembly thus becomes more and more scattered, the area in which the *Paramecia* swim back and forth being continually enlarged; but a rather sharp boundary is nevertheless maintained on all sides, as if by common consent no *Paramecium* was to pass farther out than all the rest.

Here we have what seems a decidedly complex psychological

problem,—the beginning, or perhaps even a high development, of social conditions. In the culture jars, also, we find the *Paramecia* gathered into swarms, and any proposed psychology of the Protozoa must account for these social phenomena.

Further, we find that *Paramecia* seem to have decided preferences in taste. They have a special predilection for sour, gathering with apparent eagerness into a drop of any solution having a weakly acid reaction, while their pet antipathy is toward anything alkaline in character. A drop of fluid having an alkaline reaction is therefore left severely alone and remains entirely empty when introduced into a slide of *Paramecia*. They also seem to show decided preferences as to heat and cold; they collect in regions having a certain temperature, leaving a colder or warmer area to gather in such an optimum region, just as human beings do. The whole question of how animals are attracted by certain influences and repelled by others is one of the most fundamental problems to be solved.

Thus the ordinary daily life of a *Paramecium* seems, on the face of it, to present many complex psychological problems. Apparently they feel heat and cold and govern themselves accordingly, have decided preferences as to the nature of the substances dissolved in the water, seeking some, fleeing from others; they live upon one definite sort of food and find ways of discovering a mass of such food even when scattered at a distance from it, and finally, they are social, being commonly found in swarms together and finding means of getting together even when scattered over a wide area.

From observations of this sort, some authors have concluded that such animals have a complex psychology, lacking few of the factors to be distinguished in the psychology of the higher animals. Thus, Binet says, in the preface to his book on *The Psychic Life of Micro-organisms* "We could if necessary, take every single one of the psychical faculties which M. Romanes reserves for animals more or less advanced in the zoological scale, and show that the *greater part* of these faculties belong equally to micro-organisms." Thus, it could be maintained from the brief summary I have given of the activities of *Paramecium* that these animals have *sensations* of various sorts, since they distinguish heat and cold, acids and alkalies; that they exercise *choice* in that they gather in the regions of certain agents, while they turn away from others; that such choice in itself implies *intelligence*; that the choosing and gathering about masses of food implies a *memory* of the qualities of this substance as compared with others; that they show such *emotions* as fear by fleeing from injurious substances (Binet expressly states this); that finally, acute senses, memory, choice, social instinct, intelligence, and a whole host of higher mental attributes, are

necessarily implied in the phenomenon of their seeking each other's society and gathering together even from a considerable distance into crowds.

Is it possible by a closer analysis of the phenomena to simplify this complex psychology which seems forced upon us by the observed facts?

First, we should examine a little more closely the structure of the animal to see what is here available for the production of these results. Often function depends upon structure to such an extent that what appears to be a complex activity is found to be only the automatic result of the simplest movements of a peculiarly constructed organ or set of organs.

Paramecium is an elongated animal, with one end (the anterior) narrower and blunter, while the other (the posterior) is broader and pointed. On one side of the animal (the oral side) a broad oblique depression, called the oral groove, runs from the anterior end to the mouth, in the middle of the body. Near the opposite side (the aboral side) are two contractile vacuoles imbedded in the protoplasm. The mouth is a small opening at the end of the oral groove in the middle of the body; from it a narrow ciliated tube, the gullet, passes into the internal protoplasm. In the center of the animal are imbedded the single large macro-nucleus and the single small micro-nucleus. The entire body is thus a single cell. Under ordinary conditions all the cilia of the body strike backward, which of course drives the animal forward. The stroke of the cilia is apparently somewhat oblique, for as the animal moves forward, it at the same time continually revolves on its long axis; in this way the oral and aboral sides continually interchange positions.

Now the structure and ordinary movements of the animal explain a certain activity which in higher forms may be associated with some degree of psychological complication, namely, the taking of food. Since the oral groove is ciliated like the rest of the body, when the cilia strike backward in the ordinary forward motion a current of water is produced running in the oral groove backward to the mouth. Small particles such as Bacteria, are thus carried automatically to the mouth. The mouth and gullet are ciliated and the cilia strike toward the interior of the animal, hence the particles arriving at the mouth are carried by the cilia into the interior, where they undergo digestion. The taking of food is thus purely automatic.

Moreover, as has long been known, Paramecia and similar animals seem not to exercise a choice as to the nature of the food which they take. Any small particles such as will pass readily down the gullet are swallowed with the same avidity as the Bacteria, it matters not how indigestible they may be.

But, as we have seen above, if a small piece of bacterial

zoogloea on which the animals feed is introduced into a preparation of *Paramecia*, the latter soon find it and crowd around it. It seems possible, therefore, that the choice of food takes place merely a step sooner than with higher animals, the *Paramecia* choosing the food by gathering around it,—then taking whatever comes. To test this we introduce a bit of filter paper into the preparation in place of the bacterial mass. The *Paramecia* collect about it exactly as about the zoogloea. They gather from all parts of the preparation and crowd upon it with the same apparent eagerness as previously upon the food mass. The same results are gained with bits of cloth, cotton, sponge, or any other loose or fibrous bodies. The *Paramecia* remain assembled about such bodies indefinitely, the oral cilia working away at bringing a current to the mouth, which current carries no food particles whatever.

Thus it appears that *Paramecia* exercise no choice as to the nature of the substances which they use for food, gathering indifferently about loose fibrous bodies of any sort, and swallowing particles of any kind or none at all, as chance may direct. We may cut out, therefore, any psychological qualities deduced alone from the supposed choice of food, putting in their place merely the fact that *Paramecia* react in a peculiar way when they come in contact with bodies of a certain physical texture. The reaction consists essentially of a quieting of the cilia over the greater part of the body, while those in the oral groove continue to strike backward, causing a current toward the mouth,—the body of the animal remaining nearly or quite at rest. It is important to recognize, in calling this a reaction, that it is not shown by a movement, but by a *cessation* of part of the usual motion.

Having been so successful in reducing the matter of feeding to simple factors, we may attack at once the most complex problem of all—the social phenomena shown in the gathering together of the scattered animals into a close group, as already described. Is there any way of dispensing with the sharpened senses, memory, social instinct, intelligence, and the like, which seem to be involved in these phenomena?

The possibility suggested itself that these collections might be due to the presence of some substance which was attractive to the *Paramecia*, and into which all would gather with one accord,—so that the fact that they approached each other would be a secondary result. This led to an extended study of the chemotaxis of *Paramecia*, the results of which are detailed in the first of the papers above referred to. It was found that *Paramecia* are attracted by all acids, and that in the case of any unknown substance having marked attractive properties, it can be predicted with a high degree of certainty that this



substance will be found to have an acid reaction. Carbonic acid ( $\text{CO}_2$ ) especially was found to exercise a strong attraction on the infusoria.

Now these animals, like all others, of course excrete carbon dioxide, which must therefore find its way into the water. The quantity of  $\text{CO}_2$  thus produced by one of the dense assemblages of *Paramecia* was shown to be distinctly appreciable by chemical reagents, by means of the following experiment: *Paramecia* were mounted in water to which a distinctly reddish color was given by mixing with it a small quantity of rosol. This substance has the property of being decolorized by carbon dioxide. The rosol does not injure the *Paramecia*, and they soon gather together in a dense collection, as in ordinary water. By observing the slide against a white background it is soon noticed that the solution is losing its color about the group of *Paramecia*. The colorless area after a time spreads, and at the same time the group of *Paramecia* begins to break up, as previously described. The *Paramecia* swim back and forth in the colorless area (that is, the area containing  $\text{CO}_2$ ), from one side to the other, but without passing its boundaries. The colorless area increases in size, and the area in which the *Paramecia* swim back and forth keeps exact pace with it; the two coincide throughout.

The same phenomena may be produced by introducing a small bubble of  $\text{CO}_2$  into the slide. The *Paramecia* collect closely about the  $\text{CO}_2$ , pressing against the bubble. In this way a dense mass is soon formed. After a time, as the  $\text{CO}_2$  diffuses, the mass loosens; the *Paramecia* swim back and forth in the area of diffusing  $\text{CO}_2$ , not overpassing its boundaries. The phenomena caused by the presence of a bubble of  $\text{CO}_2$  are identical in every respect with those which are apparently spontaneous. There is no question but that the assembling of the *Paramecia* into crowds is due to the presence in these crowds of  $\text{CO}_2$  excreted by the animals themselves.

Thus it appears that our social phenomena, with all their implications of higher mental powers, have evaporated into a simple attraction toward carbon dioxide.

But how do the animals succeed in collecting from a distance? At first they are distributed throughout the entire preparation; when we introduce the bit of bacterial zoogloea or filter paper, how do the *Paramecia* discover its presence, so as to collect about it? From the general wreck of higher mental qualities, can we not save at least the *acute senses* necessary to account for these phenomena?

To determine how the *Paramecia* succeed in finding and collecting about a small solid placed in the middle of a large slide, it is necessary to study the ordinary method of locomotion of the

animals. "If a preparation of *Paramecia* on a slide, containing in one spot a small bit of filter paper is closely observed, the *Paramecia* are seen at first to swim hither and thither in every direction, apparently without directive tendency of any sort. . . . Soon a single individual strikes in its headlong course the bit of paper. It stops at once, often starts backward a slight distance, and whirls about on its short axis two or three times, then settles against the bit of paper and remains. Quickly another and another strike in the same way and remain. Now the excretion of  $\text{CO}_2$  by the animals gathered together begins to take effect; the region becomes a strong center of attraction, and in ten to fifteen minutes, and often less, the paper is surrounded by a dense swarm of *Paramecia*, containing a large majority of all those in the preparation." (I, p. 299.) Thus, the finding of the bit of paper is due simply to the roving movements of the animals. Moreover, for gathering in an area containing  $\text{CO}_2$  or other acid alone, a similar dependence upon chance motions appears. There is no swimming in straight radial lines to the area of  $\text{CO}_2$  as a center; the *Paramecia* swim at random until they come by accident into the region of  $\text{CO}_2$ ; there they remain. The precise place where a group of *Paramecia* is formed in some part of a slide into which nothing has been intentionally introduced that would act as a center of attraction is determined by chance factors. One or two individuals, perhaps, strike by accident a bit of solid matter suspended in the water, or a slight roughening of the cover glass; the thigmotactic reaction is set up, so that they stop, and as a result the region becomes a center for the production of carbon dioxide. The remainder of the collection is then due to  $\text{CO}_2$ , and takes place in the manner last described.

We must, therefore, along with the rest, dispense with specially acute senses. The *Paramecia* do not react until they are in actual contact with the source of stimulus, and for coming in contact with the source they depend upon roving movements in all directions.

Thus we find that all more complex psychological powers deduced from the "social phenomena," as well as those from the choice of food, must fall to the ground. For explaining all the phenomena with which we have thus far dealt, but three factors are necessary: (1) the customary movements of the unstimulated animal; (2) the cessation of these movements, except those in the oral groove and gullet, when in contact with solids of a certain physical character; (3) attraction toward  $\text{CO}_2$ .

We have still remaining to be accounted for psychologically the *attraction* toward certain reagents and conditions, as toward  $\text{CO}_2$  and toward the optimum temperature, and the *repulsion* to-

ward other reagents and conditions, such as alkalies, and cold or great heat. This selective attraction and repulsion is a phenomenon of great importance, seeming in itself to imply a *choice* on the part of the organisms. If they move toward certain sources of stimuli and away from others, this seems to involve a perception of the localization of things, and this can hardly be regarded otherwise than as at least the beginnings of intelligence. Moreover, from its apparent general occurrence, much theoretical significance has been attached to it. Now *how* does this attraction and repulsion take place? Organisms usually move by means of certain organs of locomotion; attraction and repulsion cannot therefore be left as abstract ideas, but it must be shown how the attractive agent sets these organs in operation in such a manner as to bring the animal nearer; how the repellent agent succeeds in affecting the locomotor organs so as to carry the animal away. To apply this to the particular case in hand, when a drop of some attractive solution is introduced into a slide of *Paramecia*, how does it succeed in affecting the cilia of the animals in such a way that they turn toward and enter the drop?

Exact observation of the method by which the *Paramecia* enter such a drop shows that this question is based on a false assumption. *The animals do not turn toward the drop.* Such a drop diffuses slowly, so that its margin is evident, and the *Paramecia* may be seen in their random course to almost graze the edge of the drop without their motion being changed in the slightest degree; they keep on straight past the drop and swim to another part of the slide. But of course some of the *Paramecia* in their random swimming come directly against the edge of the drop. These do not react, but keep on undisturbed across it. But when they come to the opposite margin, where they would, if unchecked, pass out again into the surrounding medium, they react *negatively*—jerking back and turning again into the drop. Such an animal then swims across the drop in the new direction till it again comes to the margin, when it reacts negatively, as before. This continues, so that the animal appears to be caught in the drop as in a trap. Other *Paramecia* enter the drop in the same way and are imprisoned like the first, so that in time the drop swarms with the animals. As a result of their swift random movements when first brought upon the slide, almost every individual in the preparation will in a short time have come by chance against the edge of the drop, will have entered and remained, so that soon all the *Paramecia* in the preparation are in the drop. If, however, the drop is not introduced until the *Paramecia* have quieted down, it will be found to remain empty; this shows the essential part played by the roving movements in bringing the collection together.

Thus it appears that the animals are not attracted by the fluid in the drop; they enter it by chance, without reaction, then are repelled by the surrounding fluid. This is true for all apparently attractive reagents or conditions. *Paramecia* are not directly attracted by any substance or agency; the assembling in the region of certain conditions being due to the repellent power of the surrounding fluid, after the *Paramecia* have entered by chance the area of the conditions in question.

There remains then as a motor reaction only the *repulsion* due to certain agents and conditions. Is this repulsion an ultimate fact in the psychology of the animal, or is it possible to analyze it further?

The first thing which a *Paramecium* does on coming in contact with a drop of repellent solution is to reverse all its cilia, so as to swim straight backward,—at the same time revolving on its long axis in a direction opposite to that in which it was previously revolving. Next it turns to one side a certain amount, then swims forward again, on a path which lies at an angle to the path in which it was first swimming. Briefly stated, it adopts the very rational plan of backing off, turning to one side, and swimming on past the obstacle. We must apparently concede the *Paramecium* at least a modicum of intelligence for the very practical way in which it meets this emergency.

But suppose the animal touches the margin of the drop obliquely, or brushes it only on one side as it swims past it through the water; what course will it then take? From its sensible behavior under the previous conditions we shall expect it to sheer off, away from the drop, and keep on its way undisturbed or at a slight angle to the original path. But when we observe such a case, we find that the *Paramecium* backs off, swimming straight backward, as before, then turns through an angle, then swims forward, exactly as in the previous case. And curiously enough, it by no means turns directly away from the drop, but fully as often turns toward it, so as to strike it squarely the next time it moves forward. If this occurs, the whole operation is repeated; the animal tries, as it were, for a new opening. Sometimes it is necessary to repeat the operation several times before the *Paramecium* succeeds in getting away from the repellent object.

Under these circumstances the animal evidently gives much less indication of intelligence, and the fact that it reacts in exactly the same way under such different conditions is especially fitted to shake confidence in its mental powers. Apparently the swimming backward has no relation to the position of the source of stimulus, but occurs merely as a result of the fact of stimulation, without reference to its localization. Whether

this is true as a general statement can be tested by giving the animal a general shock without localizing the source of stimulus at all. This is easily done by immersing the *Paramecia* directly into solutions of such a nature that they act as stimuli. In such a case the stimulus acts upon the entire surface of the animal at once, so that there is no obstacle to be avoided and no reason for swimming backward.

Immersing *Paramecia* thus into solutions of different kinds, it is found that the first thing they do in every case is to reverse the cilia and swim backward. Nor is this all. The entire reaction is given, just as when the source of stimulus was at one end or one side; the animal first swims backward, then turns, then swims forward. This is true for all classes of stimuli,—chemical solutions of all sorts, water heated considerably above the optimum temperature, water at the freezing point, and solutions active only through their osmotic pressure. The duration of the different parts of the reaction varies much in different agents, but the essential features of the reaction are the same everywhere.

It therefore appears that not only the backward swimming, but also the turning to one side takes place without reference to the localization of the stimulus,—both occurring equally when the stimulus is not localized at all. But what determines the *direction* in which the *Paramecium* turns?

Careful observation of *Paramecia* under conditions which compel them to move slowly shows that after stimulation *they always turn toward the aboral side*,—that is, the side opposite the oral groove. The direction of turning is thus determined by the structure of the animal, and has no relation to the position of the source of stimulus. The mechanism of the turning is as follows: after the first reversal of cilia, those in the oral groove begin to strike backward again, tending to drive the animal forward, while the remainder of the cilia on the anterior half of the animal *strike transversely toward the oral side*. This results in turning the animal toward the aboral side.

We find, therefore, that the direction of motion throughout the entire reaction depends upon the structure of the animal and has no relation to the localization of the stimulus. The reaction may be expressed completely, omitting all reference to the position of the stimulus, as follows: after stimulation the animal swims with the more pointed end in front, turns toward the aboral side, then swims with the blunter end in front.

It is of course a matter of chance whether this turning toward the aboral side carries the animal away from the source of stimulus or toward it. Frequently the latter is true; in this case the operation is repeated when the animal comes again in contact with the stimulating agent. As the animal revolves

continually on its long axis, the aboral side will probably lie in a new position at the next turning, so that the animal will turn in a new direction. If this is repeated, the chances are that in time the obstacle will be avoided.

Thus, not only is it true that *Paramecium* is not attracted by any agent or condition, but also we cannot say, speaking strictly, that it is repelled by any agent or condition. Certain agents set up a reaction in the animal, the directive features of which depend entirely upon the structure of the organism,—just as certain stimuli cause an isolated muscle to react. We cannot say that the *Paramecium* is repelled by the stimulus, any more than we can say that the contraction of the muscle is due to the muscle's being repelled by the stimulus. It is true that the source of stimulus is more often at the blunt or "anterior" end, in the case of *Paramecium*, so that swimming toward the sharp end does, as a matter of fact, usually result in taking the *Paramecium* away for a short distance from the source of stimulus. But this usual position of the source of stimulus is from a physiological standpoint purely accidental, and the reaction produced is the same whether it occupies this position or another. If the animal is stimulated at the posterior end, it swims backward, therefore toward the source of stimulus; in this way it may enter a destructive chemical solution and be immediately killed, though the same chemical acting upon the anterior end would of course have caused the animal to swim away. This is seen in a particularly striking manner in the larger infusorian *Spirostomum ambiguum*, which is so large that it is easy to apply a stimulus to any desired part of the body. It is then found that the animal reacts in exactly the same manner whether stimulated at the anterior end, the posterior end, or the side, the direction of motion having absolutely no relation to the position of the source of stimulus. The same is true for *Paramecium*, though its smaller size makes the demonstration more difficult.

A strict parity is therefore to be observed between the reactions of *Paramecium* and those of an isolated frog's muscle. *Paramecium* responds to any stimulus by a definite, well characterized reaction. "The same may be said of the isolated muscle of a frog. The intensity of the reaction varies with the nature and intensity of the stimulus; this also is true for the muscle. Under certain influences the *Paramecium* remains quiet; likewise the muscle. The directive relations of the motions are determined both in the *Paramecium* and in the muscle by the structure of the organism, not by the position of the source of stimulus. There seems, then, no necessity for assuming more in order to explain the reactions of the *Paramecium* than to explain the reactions of the muscle. We need, there-



fore, to assume nothing more than irritability, or the power of responding to a stimulus by a definite movement, to explain the activities of *Paramecium*" (II). The long catalogue of psychical qualities required to account for the movements of *Paramecium* is thus reduced to simple protoplasmic irritability.

The method by which *Paramecia* collect in the regions of influences of a certain character and leave other regions empty, may be stated in general terms as follows: Certain stimuli cause in the animals random motions, in which the direction is frequently changed, especially at the moment when the stimulus begins to act. These random movements result, through the laws of chance, if continued long enough, in carrying the *Paramecia* out of the region of influence of the agent causing the stimulus. Coming thus by chance into a region where such movements are not caused, the *Paramecia* remain; if this ineffective area is small, the *Paramecia* are crowded together within it and give the impression of being strongly attracted by it.

"It is evident that we have in this case as near the reaction postulated by Spencer and Bain for a primitive organism—namely, random movements in response to any stimulus—as is likely to be found in any organism. The motions are strictly random in character so far as the position of the source of stimulus is concerned. . . . And by the repetition of the reaction the direction of movement is frequently changed,—always without reference to the localization of the stimulus. It appears not to have been foreseen theoretically that such random movements would of themselves, if continued, carry the animal out of the sphere of influence of the agent causing them and keep it from re-entering. To accomplish this result it is only necessary that the direction of motion should be changed at the moment when the stimulus begins to act and at intervals so long as it continues" (II).

An examination of the activities of a number of other unicellular organisms in the light of the observations above detailed shows that they react in essentially the same manner. For each organism a simple statement can be given for the reaction to any stimulus. For *Spirostomum ambiguum* the reaction is as follows: the animal contracts, swims backward, turns toward the aboral side, and swims forward. *Stentor polymorphus* contracts, swims backward, turns toward the right side, and swims forward. A number of flagellates also have been found to have such a fixed method of reaction. In all these cases the direction of motion has no relation to the position of the source of stimulus, and the conclusions to be drawn for *Paramecium* apply equally to these organisms.

In regard to the position in the psychological scale to be as-



signed to *Paramecium* the following may be said: The reactions of *Paramecium* are, as we have seen, comparable in all essentials to those of an isolated muscle. In neither case has the direction of motion any relation to the position of the source of stimulus. Reaction in such a manner as to show a relation to the position of the stimulating agent has rightly been regarded as a first and lowest step in perception; this lowest step is quite lacking in *Paramecium*. Moreover, *Paramecium* has no "life history" in the sense of a change in its reactions such as between the reactions of a young and an adult higher animal. An individual undergoing division reacts exactly like the ordinary *Paramecium*, as do likewise the halves immediately after division. In the words of Professor Baldwin, "the fact of life history is just what distinguishes an organism from what is a 'mechanical arrangement.'" While we cannot deny that *Paramecium* is an organism, this fact shows the machine-like nature of its activities. An animal that learns nothing, that exercises no choice in any respect, that is attracted by nothing and repelled by nothing, that reacts entirely without reference to the position of external objects, that has but one reaction for the most varied stimuli, can hardly be said to have made the first step in the evolution of mind, and we are not compelled to assume consciousness or intelligence in any form to explain its activities.

## A STUDY OF ANGER.

By G. STANLEY HALL.

Psychological literature contains no comprehensive memoir on this very important and interesting subject. Most text-books treat it either very briefly or not at all, or enumerate it with fear, love, etc., as one of the feelings, sentiments or emotions which are discussed collectively. Where it is especially studied, it is either in an abstract, speculative way, as in ethical works, or descriptively as in books on expression or anthropology or with reference to its place in some scheme or tabulation of the feelings, as in many of the older works on psychology or phrenology, or with special reference to some particular and partial theory as in the Lange-James discussions, or its expressions are treated in the way of literary characterizations as in novels, poetry, epics, etc., or finally its morbid and perhaps hospital forms are described in treatises on insanity. Observers of childhood, like Darwin, Taine, Preyer, Perez, Baldwin, Mrs. Moore, Miss Shinn, Sully and many others sometimes ignore it as too painful a trait to be fully described by fond parents or relatives, or briefly characterize single outbreaks, or special features in a single child. The outlook and the reactionary stages are sometimes confused, and there is nowhere any conception of the vast diversities of its phenomena in different individuals; so that we find not only great divergence but the most diametrical contradiction in describing its typical physical expressions. In some, *e. g.*, Stanley, it is *sui generis* and unique from the start; and for others, *e. g.*, Mantegazza, it shades by imperceptible gradations over into fear and love with few characteristics solely its own. Its physiological basis may be blood composition, digestive or hepatic changes in vascular contractions, abnormal secretions, non-removal of waste or toxic products, over lability of central nerve cells, reflex muscle tension, etc. At present the general subject of anger is a tumbling ground for abstract analysis and *a priori* speculation, which must be gradually cleared up if psychology is to advance from the study of the will to the feeling. Just now the chief obstacle to this advance is strangely enough the Lange-James theory, the general acceptance of which, puerile as it is in view of the vastness and complexity of the field, would do for this general tendency of psychology a dis-service comparable only with that which Descartes's catchy

dictum, that animals were mere automata, did for the advance of comparative psychology in his day.

I have collected the following, far from exhaustive list of English bearing on this state, additions to which in English or other languages also rich in such terms, are invited.

Acrimonious: sharp, pungent, biting.

Aggrieved: made heavy, severe, loaded.

Affronted: confronted offensively.

Angry: root *ang*=straightened, troubled. *Angor*, strangling. Angere, to choke, stifle. *Arxio*=throttle. Awe and ugly have the same root, and ache is related, as are anxious and anguish. Other etymologies closely relate it to fear.

Animosity: hostile spirit, more vehement and less lasting than enmity.

Antagonistic: to a foe or adversary opponent.

Antipathy: instinctive and involuntary dislike, repugnance, distaste, disgust.

Aversion: turning from.

Bitter: biting, cutting, sharp, referring to the sense of taste.

Boiling: as a fluid from heat. Temper has a boiling point.

Breakout: restraint or inhibition giving way. *Cf. ausgelassen*, not peculiar to anger.

Brood: to incubate, nurse, keep warm.

Chagrin: mortify, keenly vex as at disappointment.

Chafe: as when the epidermis is worn off to the quick.

Choleric: from Latin and Greek, cholera=gall, bile. The liver was long regarded as the seat of anger and of love.

Contempt: scorn, despise, mépris.

Crabbed: scratch, claw, wayward in gait, not letting go.

Cross=curly, crimped, crooked. *Cf.* a "crook" in body or mind, cross-grained.

Cruel: morally crude, and from the same root, pitiless, loving to inflict suffering.

Crusty: brittle, short.

Curt: short and sharp.

Dander up: dandruff, scurf, ruffled temper.

Defiant: renouncing faith or allegiance, and challenging.

Demoniacal: possessed by an evil spirit.

Displeased: designating all degrees of being offended.

Enmity: inimical to an enemy.

Evil: exceeding limits, bad, depraved, vicious, not peculiar to anger.

Fierce often used for anger. *Ferus* (wild savage) cognate with *fera* (wild beast). *Cf.* wild with rage, savage resentment, mad as a hornet, angry as a bull, cross as a bear.

Fight: fighty.

Flare up: *Cf.* blaze out, inflame.

Fit: spasm, convulsion, spell, not peculiar to anger.

Fractionious: fret, rebellious, warmly restive, easily broken.

Frantic: phrenetic, very excited, not peculiar to anger.

Frenzy: same root as frantic.

Fretty: abrasion, corrosion, chafing.

Fume: to smoke. *Cf.* thumos, spirit, anger.

Fury: storm of anger, possessed by the furies.

Gall: ref. to liver as seat of anger.

Glum: frown, stare, sullen.

Grim: stern, forbidding, severe, angry.

Gritty: sharp, grains of sand, pluck.

Grouchy: turbid as liquor, dreggy, roily, surly.

- Grudge: crumble, crush, ill will and envy.  
 Gruff: rough.  
 Grumpy: *Cf.* grim and many Teutonic words. Gram=to rage, roar, akin to sorrow, and related to grin, groan, grumble, make a noise.  
 Haste: too quick wrath or temper.  
 Hate: aversion, extreme detestation, repugnance.  
 Hostile: with enmity, antagonistic.  
 Hot: warm, heated.  
 Huffy: puffed, swelled with rage.  
 Impatient: the opposite of patience and long suffering.  
 Indignant: at the unworthy or mean.  
 Inflamed: a thermal analogy, combustible. *Cf.* flare up.  
 Insane: unwell, anger is a brief insanity. *Cf.* mad.  
 Ire: irascible, iracund.  
 Irritable: excitable, chiefly applied to temper.  
 Mad: a mad state, furious.  
 Malevolent: willing or wishing evil.  
 Malice: malus, bad, with ill will, malicious.  
 Malignity: *Cf.* malign, producing malice.  
 Morose: fretful.  
 Mucky: like muck, nasty, of temper.  
 Nasty: used of bad temper.  
 Nettled: stung with nettles.  
 Obstinate: standing against.  
 Offended: struck against.  
 Old Adam: aroused.  
 Passionate: of any passion but prominently of anger.  
 Peevish: feebly fretful, literally crying as a child.  
 Pet: *Cf.* pettish, as a spoiled child or pet.  
 Petulant: in a little pet.  
 Piqued: pricked, stung, nettled, angered.  
 Possessed: as if by a bad spirit.  
 Provoked: called out, incited to anger.  
 Put out: as of gear, off his nut, trolley, etc.  
 Putchy: New England for touchy.  
 Quarrelsome: prone to contend, also querulous.  
 Rage: *Cf.* rabies: a furious degree of anger.  
 Rancid: spoiled, tainted, rank, applied to butter.  
 Rancor: *Cf.* rancid, something that rankles.  
 Raving mad: as a horse, also roaring mad.  
 Refractory: breaking away.  
 Repugnance: contradiction, fighting against.  
 Resent: to have strong feeling against or take offense.  
 Retaliate: pay back in like.  
 Revenge: requite, retribution.  
 Riled: as mud stirred up in water.  
 Ructious: (belching) is widely used in New England of angry states.  
 Ruffled: hair or plumage tousled or stroked the wrong way.  
 Savage: like beasts or barbaric men.  
 Scorn: literally mockery, disdain, despise.  
 Sharp: used of temper.  
 Snarly: as of a dog.  
 Snappish: short, crusty, tart, disposed to bite.  
 Sore: literally aching, morbidly tender or irritable.  
 Sour: acid, mordant, the sours.  
 Spite: petty ill will.  
 Spitfire: a hot tempered person.  
 Splenetic: the spleen was supposed by the ancients to be the seat of anger.

Spunk: tinder, sponge.  
 Stark mad: stiff, naked, strongly angry.  
 Stormy: violent, gusty.  
 Stern: austere, rigid, severe.  
 Stubborn: stubbed, strongly obstinate.  
 Sulk: refuse to act or respond.  
 Sullen: glum and gloomy.  
 Surly: doggedly rude, rough.  
 Tantrum: literally=sudden impulse.  
 Tart: acidulous.  
 Tear: *Cf.* Zorn=rend, destroy, rip, burst, tearing mad.  
 Tempestuous: *Cf.* stormy.  
 Temper: disposition, hasty of temperament.  
 Testy: snappish.  
 Tew: used in New England for the fretting of infants.  
 Touchy: like proud flesh.  
 Ugly: literally horrid, unsightly.  
 Up on his (or her) ear.  
 Vengeance: *Cf.* vindictive, retribution, revenge.  
 Vex: literally to shake, to badger, bother.  
 Vicious: *Cf.* vitiated, addicted to vice.  
 Vile: used of temper.  
 Violent: infuriate, vehement, impetuous, turbulent.  
 Volcanic: explosive, eruptive.  
 Waspish: sting on too little or no provocation.  
 Wild: untamed, undomesticated.  
 Wode, wood: Wut=mad, furious, frantic, stirred up. *Cf.* woden wütendes Heer.  
 Wrath=cognate with writhe, twist, turn to and fro, and with many words in other Teutonic languages with like meaning.

After a learned and valuable discussion, Chamberlain<sup>1</sup> sums up the etymological meanings of words for anger as designating (1) choking and strangling, Eng. *anger* and its cognates; (2) writhing and twisting, *wrath*; (3) crookedness, curling, *cross* and its cognates; (4) bursting and tearing, Ger. *zorn*; (5) hasty movements, *fury*, Gr. *ὀργος*; (6) seizing and grasping, *rage* and derivatives; (7) making a noise, *yelling*, Ger. *Grimm*, Tahitian *riri*; (8) malicious talk, slander, Ger. *böse*; (9) mental excitement, Lat. *vates*, Gr. *μῆνις*; (10) swelling, Gr. *ὄργη*, Samoan *huhu*; (11) based on the heart, Kootenay, *sani-ikwina* and others; (12) on the liver, gall, bile, spleen, etc., and other words in various languages based on the stomach, nose, forehead, etc. Helpful as it is, this classification, as will be apparent from my list above, is not adequate. These words are interesting reflections of the ancient folks' conception of anger and are, as would be expected, nearly all physical.

Older medical writers, Gebhardus (1705), Slevoytius (1711), Fickius (1718), Clavillart (1744), Bender (1748), Regenhertz

<sup>1</sup> On Words for Anger in Certain Languages. A Study in Linguistic Psychology. *Am. Jour. of Psychology*, Jan. 1895, Vol. VI, No. 4, pp. 585-592.

(1757), Estrevenart (1788), Becker (1811) and Regenbogen (1820), discussed the physiological effects of anger, urged its occasionally beneficial and even therapeutic effects. A group of French writers: Hiver (1815), Bemont (1816), Bigot (1818), Sallemund (1823), Boscher (1833), gave more or less elaborate descriptions of its phenomena and therapeutic treatment; and Baunus, Gallot, Husson, Ponte, Schneider and others have described cases of sudden death, loss of consciousness, convulsions caused by it, or have discussed its relations to drunkenness.

H. L. Manning<sup>1</sup> reports a case of rupture of a cerebral artery due to anger at an animal in a stable; compares brooding to a mental canker; thinks it may cause cancer and is liable to foreclose a mortgage of weakness in some organs at any time, urges that anger has the same sense as angina and that people whose temper is very sensitive are very selfish. Pointé<sup>2</sup> shows how violent anger may cause icterus, hernia, syncope, apoplexy, mania, hysterical attacks, mutism, etc. Many records of similar cures could be gathered from medical journals.

Forensic medicine, since Platner's important treatise on *ex-candescencia furibunda*, in 1800, has dealt with anger.<sup>3</sup> Misers are inflamed by loss of gold, the proud by slights, lovers by petty offences by or against their mistresses. Morbid onsets of anger are manias of brief duration, and some forms of mania may be characterized as long-continued anger without objective cause. The impulse is irresistible and there is loss of psychic freedom. Again the provocation may be so strong as to break down all the inhibition that comes from restraining motives, and to cause the mind to be beclouded, or the outbreak may be too sudden for the slower, later acquired, and long circuiting apparatus of control to be set in operation, so that responsibility is lessened or indeed removed. Friedreich also thinks the storm of passion may temporarily obstruct the power of self-direction. Feuerbach says "Murder in a moment of passion is a crime possible for the noblest natures," and he goes on to describe conditions under which the act would not only be justifiable but noble. Rare as such cases are, he urges that crimes committed in sudden anger should have individual study.

The murder of her seducer, by Maria Barbellina (a case so well studied by Hrdlicka), committed in an automatic state not remembered afterwards, was essentially anger intensified to a full and typical epileptic attack.

Rush<sup>4</sup> urges that the term gentleman implies a command of

<sup>1</sup> *Journal of Hygiene*, 1895, p. 324.

<sup>2</sup> *Gazette des Hôpitaux*, 1898, p. 273.

<sup>3</sup> Cf. Friedreich: *Gerichtliche Anthropologie*, 1859, Ch. III, p. 20, *et seq.*

<sup>4</sup> *The Mind*, pp. 331, *et seq.*

this passion above all others, cites Newton's mild words to his little dog, which set fire to the calculations of years: "thou little knowest the mischief thou hast done," mentions a clergyman who demonstrated a proposition of Euclid as a sedative, commends Thety's mode of allaying the anger of her son Achilles by exciting the passion of love, advises a milk and vegetable diet and avoidance of all stimulants, even the moderate use of which predisposes to anger, advises drinking cold water, and in extreme cases a douche with it, and suggests that if due to weak morbid action wine or laudanum may help.

Savage races often work themselves up to a transport of rage for their battles by dances and yells, and rush upon the foe in blind fury. Sometimes the real fighting begins over the division of the booty with sickening sights of savage ferocity, more men being killed thus than in the original capture of the plunder, and blood feuds may augment the horror of it all.<sup>1</sup> The warrior's face is made up in the most fiendish way, his weapons suggest torture more than death, as do even his ornaments, and his scars are eloquent of the most desperate encounters.

Running amok<sup>2</sup>, common among Malays and in other Oriental lands, has been variously described. An athletic man, who thus gives way to either revenge, religious frenzy, acute mental or bodily suffering, or to the various other causes assigned, often shaves off all the hair on his body, strips every vestige of clothing, oils or greases his body from head to foot, and armed with a dagger or knife runs at the top of his speed, stabbing every living creature he can get at. He runs straight ahead, rarely turning corners, never entering houses, and like an enraged human tiger never stops in his career of destruction, often with his head bent low like a battering ram, slippery as an eel, smeared and dripping with blood, till some one kills or at least stuns him. Formerly, poles with prongs were kept in every village to ward off or pin the Amokers who were far more frequent than now. The attack is not due to intoxication nor are the Malays subject to ordinary epilepsy, but it occurs when pain, grief, gloom, and loss of hope nursed by brooding, bring on what their language calls heart-sickness. When Job was tempted to curse God and die, or when we are goaded to desperation and break out from all the control of prudence and speak or act with abandon, reckless of consequences, wounding friends and foes, the Malay rushes, slashes right and left, plunges into the sea, etc. When medically examined they are

<sup>1</sup>I. Thompson: *Through Masai Land*, p. 255.

<sup>2</sup>The Amok of the Malays, by W. Gilman Ellis, M. D. J. of M. Science, July, 1893.



in an excited state which lasts for hours or days, and sometimes with complete amnesia of the crisis. Its onset is very sudden and seems uncontrollable and paroxysmal.

In the Viking Age<sup>1</sup> each champion wanted to become a Berserker (fighter without a shirt). These bravest of men wrought themselves into such a frenzy at sight of their foe that they bit their shields and rushed forward, throwing away every weapon of defence. The berserk fury was utilized, not only for war but for performing hard feats beyond the power of common people. "In some cases this fury seems to have overcome the Berserks apparently without cause, when they trembled and gnashed their teeth." When they felt it coming on, they would wrestle with stones and trees, otherwise they would have slain their friends in their rage. In their greatest fury they were believed to take the outward shape of an animal of great strength and perversity. When great champions went berserking and were angry, they lost their human nature and went mad like dogs. They vowed to flee neither fire or iron, and in days of incessant warfare, died singing their brave deeds, and as they entered Valhalla could hear the lay of the scalds recounting their acts of prowess.<sup>2</sup> Sometimes in the acme of their rage, the mouth was open and frothing, and they howled like beasts and spared nothing in their course. Afterward they were weak, and calling their name often cured them.

At quarter races in some parts of the south, near the close of the last century, cock fights where the birds were armed with steel spurs with which they cut each other to pieces, wrestlings, quarrelings and often brutal fights occurred. In the latter, for which there were rules, "gouging" was always permissible. Each bully grew a long thumb nail for this purpose, and if he got his opponent down, would take out his eye unless he cried "King's curse." Sometimes ears were bitten off, and the yet more terrible mutilation of "Abelarding" might occur. These practices, McMaster<sup>3</sup> tells us, long prevailed as far north as the Maryland border.

The Iliad is, as the world knows, the story of the results of the wrath and bitter verbal quarrel of Achilles with Agamemnon over the priest's captive daughter, Chryseis.

Orlando Furioso, in his long search for his pagan love, Angelica, coming suddenly upon conclusive evidence that she is false to him, becomes frantic, and seizing his arms, rushes to the forest with dreadful cries, breaking and cutting trees and

<sup>1</sup> Du Chaillu: The Viking Age, Chapter XXVI.

<sup>2</sup> Simrock: Deutsche Mythologie, p. 465.

<sup>3</sup> History of the People of the United States, Vol. II, p. 5. I am indebted for this and several other references to the Librarian of Clark University, Mr. Louis N. Wilson.

rocks, destroying a grotto, and often thus terrorizing the country for days, passes raving mad through France and Spain, swims the Straits of Gibraltar and continues his devastations in Africa. For 300 verses Ariosto describes in vivid terms his desperate deeds of supernatural strength. Orlando is insanely mad and is restored only after the paladin and the apostle arrive at the magazine of good sense in the moon to find his soul securely bottled and labeled, which they return and force him to inhale, when he is restored.

Modern literature abounds in description of anger, *e. g.*, the breaking of the bull's neck by Ursus in the amphitheater to save the life of Lygia in *Quo Vadis*; the fights of Prasper and Galors in the *Forest Lovers*; Mulvaney's story in Kipling's *Soldier's Three*, where the conflict was body to body, too close to use bayonet, and the men could only push, kick, claw, maul, and breathe and swear in each other's faces, and knives danced like sunbeams, and cleft heads went down grinning in sections, revolvers spit like cats and black curses slid out of innocent mouths like morning dew from the rose. The brutal killing of Nancy by Bill Sykes; the fight with Squeers in *Nicholas Nickleby*; the conflicts in *Scott*; and from ancient mythology to the modern stage, all shows how all the world loves fighters. Dante, M. D. Conway and many other description of demons and hell abound in descriptions of anger. Volumes could be easily filled with such characterizations.

In Ireland's characterization of the insanity of power,<sup>1</sup> there are interesting descriptions of extreme and morbid anger. When angry, Claudius Cæsar is said to have grinned and foamed at the mouth. Agrippa's rage at a rival was so great that after one of them was executed, she had the head brought and opened its mouth. Commodus, by the sight of blood in the arena was aroused like a tiger on the first taste of it. He fought 735 times in gladiatorial games, took pleasure in bleeding people with a lancet, and the companions of his anger often fell victims to his rage. Mohammed Toghlaç had a passion for shedding blood, as if his object was to exterminate the human race. Executioners were always present to kill or torture on the instant those who offended him. His elephants were taught to throw his enemies into the air and catch them with their trunks, and to cut their bodies with knives fastened to their tusks. One who had provoked him was flayed alive, and then cooked with rice, and his wife and child forced to eat his flesh. Others were tied by the leg to wild horses, which ran through forests till only the leg was left. Ivan the terrible was filled with tigerish impulses by every suggestion of restraint. His jester

<sup>1</sup>The Blot upon the Brain.

displeased him and he threw hot soup in his face at the table, and then rose and stabbed him. He forced people to kill their wives, fathers, mothers and children. Death did not appease his rage, and sometimes his enemies must sit at the table for days opposite the corpses of their nearest relatives, whom he had killed. He interrupted his devotions to massacre those who had provoked him. In one case some 27,000 inoffensive people were killed before his rage was placated. He killed his favorite son and heir in a fit of anger. Another son, who was killed young, had as a child a passion for seeing slaughter, and killed animals himself for the pleasure of seeing the blood flow.

Mantegazza assumes that man has far greater capacity for pain than for pleasure, and can hate more bitterly than he can love. Love and hate are not only often mixed and felt towards the same person, but may be different degrees of the same emotive force. Anger is an expression of egoism, and vanity and hyper-self feeling intensify it. Infants hate most and most often if their feeding is interfered with, boys if play, youth if love, adults if pride, old age if conservatism, women if their affections are disturbed. Duels in their early stages as courts of honor, and lawsuits and courts of arbitration are attempts to restrain this passion which makes *homo homini lupus*. Religions at their birth are efforts to placate the anger of deities and mitigate the fires of their wrath, for God is conceived as angry daily with the wicked, and hell is hot with his vengeance. A long list of curses, perhaps elaborately formed and ceremoniously launched, and damnable oaths and obscenities, insulting names, especially of animals, imputing deformities of soul or body may be vents.

x Anger may emit its own peculiar smell; the first cry of the babe is perhaps anger, and anger may be directed toward self. In great haters the luxury of one moment of rage may be deliberately purchased by years of pain, and a city may be destroyed for a single man. Its strength is shown by the fact that while love is everywhere and always taught, and hate and anger everywhere repressed, the latter are yet so much stronger. It has all degrees from the most bestial fights for extermination up to irony, satire, criticism, coldness, neglect, teasing and many other forms. One can be angry without an object, but if we hate we must hate something. Pardon and its motivation are lightly touched upon, and placation of gods and men mark a higher stage, and the long strain of patience is a noble discipline for this *sæva animi tempestas*.<sup>1</sup>

O. Schwartz describes a form of morbid transitory rage as follows: "The patient predisposed to this, otherwise an entirely reasonable person, will be attacked suddenly without the

<sup>1</sup>Physiologie des Hasses.

slightest outward provocation, and thrown into a paroxysm of the wildest rage with a fearful and blindly furious impulse to do violence and destroy. He flies at those about him, strikes, kicks, and throttles whomever he can catch, dashes at every object near him which he can lay his hands on, breaks and crushes what is near him, tears his clothes, shouts, howls, and roars, with eyes that flash and roll, and shows meanwhile all those symptoms of vaso-motor congestion which we have learned to know as the concomitants of anger. His face is red and swollen, his cheeks hot, his eyes protrude and the whites are bloodshot, the heart beats violently, the pulse marks 110-170 strokes a minute. The arteries of the neck are full and pulsating, the veins swollen, the saliva flows. The fit lasts only a few hours and ends suddenly with a sleep of from 8 to 12 hours, on awakening from which the patient has entirely forgotten what has happened."

Kraepelin<sup>1</sup> describes morbid irascibility *iracundia morbosa* in born imbeciles of higher grade whose moral nature is somewhat developed and who have considerable school knowledge. On the very slightest occasion, they go off as if loaded into an utterly uncontrollable frenzy of rage, tremble all over, stammer out insults and curses, inarticulate cries, bite their lips and hands, run and butt their heads against the wall, try to choke themselves, tear their clothing and destroy everything within reach, till they are breathless, reeking with sweat, hoarse, and too exhausted to move. Upon the stimulus, the explosion follows with the certainty of a machine. Often such cases maintain a certain orientation and avoid attacking persons, but vent their fury upon lifeless objects as in gestures. Such attacks may last an hour or days, sinking back with a long asymptotic curve of diminishing irritability to the normal. They often have no or slight memory afterward of what occurred, lament their infirmity, beg to be bound or shut up, have all objects with which they could do injury removed. Every even imaginary infraction of their hyperalgeric egotism and selfishness may provoke imperative actions perhaps of brutal passion.

Ziehen<sup>2</sup> describes the disposition to anger which is often associated with abnormal exaltation of self-feeling as hyperthyaim. In paralytic dementia primary exaltation is a very common intercurrent stadium and is a cardinal symptom of mania. In the characteristic cyclus, the depressive stage more commonly precedes.† At the beginning and end of an anger fit the peripheral arteria are expanded, sometimes almost to the point of

<sup>1</sup> Psychiatrie, pp. 125 and 673.

<sup>2</sup> Psychiatrie, pp. 60 *et seq.*, 141 *et seq.*, 174, 242, etc.

congestion in the face; but at the acme of the explosion they are contracted and palor is most common. Respiration is prolonged and deep, the pulse wave low, the lapse of association is retarded, followed perhaps by an explosive acceleration, there is a decrease of motor-discharge, a stage of initial inhibition, succeeded by one of augmented intensity and perhaps restricted range. The play of motives is reduced, reflection drops out and sensation is applied directly to motives which are rather incoherent and unco-ordinated, and it is the shunting out of the association plexus that causes subsequent amnesia. *Furor epilepticus* is the most intense manifestation of anger. As a symptom of paralytic dementia excessive tearfulness is often associated with it, and may more or less take its place with increasing lability of mood and kind of action, and perhaps facial mimesis gestures and general agitation. Morbid irritability is not infrequent in chorea.

No one has described with such clearness and copiousness of casuistic material as Magnan<sup>1</sup> the slow accumulation of anger in paranoiacs, whom he agrees with Tardieu in calling the most dangerous of all the insane, who, on grounds of a purely hallucinatory nature, steal, insult, shout, without having given any one any intimation of the long evolution of their state of consciousness. Querulants complain of all, suspect all about them of changed feeling towards or of designs upon them. They imagine their friends look askance, are less constant in their feelings, are gossiping about them, or are fomenting plots to injure their business, reputation, etc. All is perhaps increased by auditory hallucinations and slowly the patient feels himself the victim of persecutions and surrounded by enemies with overt or covert designs upon him. Gradually reactionary impulses arise and gather force. The injuries must be resented, the guilty punished, and at length, the persecuted becomes a persecutor now entirely devoted to vengeance. Insults, denunciations, abusive letters, threatening, and perhaps written in red ink or in blood, slanders, murderous attacks and every other means are resorted to to gratify hate. No failure discourages, and then reason justifies all their acts as the inevitable retaliation to long accumulated and extreme provocation. He feels his case to be unprecedentedly and inexpressibly pathetic, one that cries to heaven for an avenger. For crimes thus motivated, when the patient has plainly lived completely into his morbid romance some authorities in forensic medicine recognize either partial or incomplete irresponsibility.

For the Herbartians, whose treatment of the feelings always must be very inadequate, anger burns outward from within,

<sup>1</sup> Paranoia, chronica, etc.

establishes a new apperception center, or *pointe de repère*, for a part of the mental content, shakes old concepts into wakefulness, and like a tide adds to one plexus of ideas what it takes from another, and has a long and slowly dying out, somatic after effect. Although perhaps at first "sweeter than honey," as Homer calls it, it belongs on the whole to the algesic and depressive group of emotions.<sup>1</sup>

Stanley<sup>2</sup> characterizes anger as more offensive than defensive, as aggressive, expansive, as peculiarly developed in the carnivora who are usually solitary because predacious habits require a wide subsistence area. Its origin marked a most important and epoch-making era, as important for psychic morphology as the vertebrate form, giving those animals that acquired it a great advantage over those which did not, and it is a great factor in the evolution of personality. Those creatures who can injure all their enemies, and men who make their acquaintances fear to make them mad, are more likely to survive. The greater and more formidable the foe the more fear expels anger and prevents its ebullition. In a certain stage it is wise to bear in mind that any friend may become a foe. (The weakness, which instead of hitting back turns the other cheek, is at a certain stage a disadvantage.) Weak people cannot hate or be very angry. It is a unique passion, complete, and a genus by itself from the start, and so must be known introspectively or not at all; is pure at first and its hybrid forms evolve later. Its organs are claws, fangs, horns, spurs, and weapons, and it tends to culminate in eating the adversary, sometimes even in anthropophagy. Hate is habitual anger and is retrospective, while anger is prospective. It represents a wild state before and below civilization which has domesticated man. Even lower animals are very sensitive to it in men. While it smoulders and even when it breaks out the intellect may look coolly on. It cannot be undirected, but must always have an object.

For Ribot<sup>3</sup> anger in the offensive form appears early (two months Preyer—ten months Darwin), and in its motor forms is the partial contraction of muscles, which are fully active in combat, involves fascination for the sight of and suffering, and in the depressed form passes over into hate and easily becomes morbid, and even epileptic and maniacal. Irresistible destructive impulses are disaggregated forms of anger, and show gradation separated from each other by imperceptible stages from pleasure in torturing and killing to satisfaction in reading of

<sup>1</sup>Volkman: *Lehrbuch der Psychologie*, Vol. II, p. 390.

<sup>2</sup>Evolutionary Psychology of Feeling. Chapter X, p. 127.

<sup>3</sup>Psychology of Emotion. Chapter III. Anger.



imaginary murders in novels, etc. All destructive impulses are at root one, and heredity and education, environment and circumstances develop them into determinate, habitual, and chronic directions. It may increase the ptomaines and cause auto-intoxication, and in the lower animal forms whose bite when angry is poisonous, and in human beings modifies the lacteal secretions of nursing mothers. It is best inhibited by fear, in some sense its opposite, and best seen in some carnivora.

Steinmetz<sup>1</sup> holds that revenge is a reaction to enhance lowered self-feeling, and primordially it is not directed against the aggressor, and Ree thinks it a reaction against the feeling of inferiority inflicted by another. At first there was no discrimination, and wrath might be wreaked upon any one, innocent or guilty. In a later stage, upon this theory, it is less indiscriminate, and some fitness is demanded in the victim, as in cases of blood feud. Last of all it was found that the wrong doer himself should bear the punishment. An Indian kicked out of a store kills a family of pigs; a relative at a funeral cuts himself "in a fit of revenge against fate" or kills some poor or defenceless person; the Navajoes, if jealous of their wives, kill the first person they meet; if one dies from an unknown cause, a victim is selected by lot, or the friends of the dead man kill the first person they meet, the bearer of bad news may suffer. All these facts and theories are combated by Westermarck<sup>2</sup> who urges many cases where carefully directed revenge is exercised by animals. From the very lowest forms anger is aimed at the cause of the pain. This weapon against injustice and injury resents aggression by counter aggression, and is thus a great aid in self-conservation and self-forgiveness. Even common tribal responsibility is a protection against the tendency of revenge to single out the guilty person. The forms and details of punishment are often elaborated.

After teaching this subject many years and with increasing dissatisfaction, I determined to try the questionnaire method and accordingly, in October, 1894, the first of an annual series of topical syllabi on Child Study, which have been continued now for four years, was published on anger and sent to nearly 900 teachers, parents and others in this country and elsewhere. It was as follows:

The phenomena wanted are variously designated by the following words: wrath, ire, temper, madness, indignation, sulks, sourness, pugnacity, crossness, cholera, grudge, fume, fury, passion, to be or fall out with.

<sup>1</sup> *Ethnologische Studien zur ersten Entwicklung der Strafe.*

<sup>2</sup> *Mind*. N. S. VII, 1898, p. 289.



1. Add any other *terms* or any euphemisms, or phrases you know or can get from children indicating their feelings.
2. Describe every vaso-motor symptom, such as flushing, paling, about forehead, cheeks, nose, neck or elsewhere. Is there horripilation, chill, shudder, tremor, prickly feeling, numbness, choking, twitching, sweating, if so where and how long. Are there any accompanying sensations of color, flushes, taste, smell, noises, (question for each sense). Can blood pressure be tested?
3. Describe all changes of muscle-tension, scowling, grinding teeth, opening lips, setting of eye, clenching fists, position of arms and attitude of body. Is there nausea or a tendency to either contraction or relaxation of sphincter muscles which control anal or urinal passages.
4. Describe overt acts, striking (how, down, straight out, with fist or palm), scratching, biting, kicking. At what part are blows or attacks aimed.
5. What is the degree of *abandon* or loss of self control? Is it complete and is the rage entirely blind, or usually is some restraint shown in intensity of blows or some consideration in the place attacked?
6. Describe long delayed anger, the venting of secret grudges long nursed, and deliberately indulged.
7. Describe intensity curve of quick and slow children.
8. Describe reactions, afterwards physical, mental or moral, whether lassitude, contrition, and all verbal or acted signs of regret.
9. How do children speak of past outbreaks of anger in themselves, and of anger in others, and in general?
10. What treatment have you found good, and what palliatives do irascible children apply to themselves?

In description be photographically objective, exact, minute and copious in detail. Tell age, sex, family life, temperament, nationality of every child. Add to all a description of your experience with anger in yourself, and if possible get a few of your adult friends whether good or ill tempered, to write theirs, or organize a little circle of friends, mothers, teachers, neighbors, to talk over the subject and to observe in concert. Above all, get children of different age and temperament to talk confidentially, or better to write their own ideas in response to such questions as tell some things which make you angry; when do you get angry easiest? how do you feel and how act, how check it and how feel afterwards? write cases of others getting angry in detail, and state what you think about it generally.

This is a subject of obviously great importance for moral and even physical education, but there is almost no literature worth reading upon it. It is so vast that it can be best explored by concerted effort. The undersigned desires to investigate the subject and invites you to co-operation by sending him any notes, however incomplete, upon any aspect of the subject. Or, if preferred, you can start with these hints and work out your own data and print your conclusions.

Let us try the concerted method of work and in some way pool its results for the mutual benefit of teachers and for the good of the children we all live for.

In answer to the above questionnaire, a total of 2,184 returns have been received in season to be included in the following report. Miss Lillie A. Williams, of the Trenton (N. J.) Normal School, sent returns from 244 persons, of which 121 were original observations of children, 92 were reminiscences, 28 information received at second hand. Principal E. H. Russell,

of the Worcester (Mass.) Normal School, sent 109 returns; 35 of which were reminiscences, mostly by his pupils and teachers, and 63 were original observations on children. Mrs. Grace B. Sudborough sent 1,016 answers to the questions with opinions upon hyperthetical stories involving anger. From an anonymous source, 147 carefully written but brief essays upon personal experiences with anger were received. Miss Carlisle, of Norwich, Connecticut, sent 95 papers, partly studies by her normal class and partly answers by school children. From California, 65 papers were received; from an unknown source, 59 papers; from Miss Clapperton, of St. George's Training College, Edinburgh, 77; from Miss A. E. Wyckoff, of Brookline, 72 personal papers; from the Springfield Training School, 24 papers; from Dr. F. E. Spaulding, Superintendent J. A. Hancock, Miss Pedrick, Miss Flora J. White, a few papers each; and from Miss Hughes, then of the Cambridge (England) Ladies' College, 31 carefully prepared papers by students, with others from other sources. Besides this, a large list of literary references have been gradually accumulating during the past five years; the subject has been made several times a matter of discussion in my weekly seminary for the comparison of experiences; and I have several times worked over portions of the subject in the form of popular and class lectures. I am under special obligations to Principal M. H. Small, of Passaic, N. J., lately my student, for the compilation of a part of this material and the selection from the mass of material of some of the typical cases.

It need not be repeated, that, as I have already said, in compiling such material, too much caution cannot possibly be exercised. The returns are of all degrees of merit, from extremely good to worthless, and it requires great and constant critical acumen to sift the chaff from the wheat; and the value of the work depends chiefly upon how accurately and thoroughly this is done. The great advantages of this method are also obvious in the data upon this topic, for the range of individual differences is vast and the fecundity of human nature in so diversifying the expressions of this sentiment is perhaps nowhere more apparent and gives constant and often deep interest in reading over the returns. Concerning no subject have I felt more strongly the necessary limitations of individual experience and how absolutely necessary as the basis for any valid psychology of the subject, it is first of all to gather a vast array of facts and cases. This and the necessity of revising current theories upon anger will explain why I introduce so many condensed accounts of concrete cases. This tends to bring psychology back again into the closest contact with a large group of the most vital facts of life and to rescue it from the narrowing and

one-ended influences of theories from which that part of it which treats of the feelings and emotions and which now seems next in order for investigation, is now so gravely afflicted. The aspects of anger are very many sided and complex, but we see here the intensity and bitterness of the struggle for survival in the past by the traces that are left in modern life. So inadequate and partial are the text-book characterizations of it that it seems well to begin a closer look at this most intricate salient group of phenomena as particularly seen in self and others.

## A. GENERAL.

+ 1. Scotch, F., 20. When in a real passion a torrent seems to rush through me with terrific force, I tremble violently and feel quite faint. When the storm is not too deep for speech, I say the bitterest things that I can think of, though often aware that I shall repent them afterward. Yet I always want to be by myself, not to listen to reason, but to stamp, beat myself and think or say all sorts of wicked things. Above all I pity myself most intensely and end in a torrent of tears. (A most aggravating fact, however, sometimes is that I cannot utter a word, no matter how eloquent I feel I ought to be. The storm within is too furious for speech, although it always ends with rain. The tears are a sign of exhaustion rather than repentance. The fits last a few moments, rarely half an hour, and to give them vent clears the air. By restraining it I feed on it and it lasts and rankles. If my anger is less violent I avoid speaking to the persons or ignore their existence, but my icy silence will melt despite my resolution. It kills love and admiration however.)

2. M., 31. My capacity for anger is great and deepens into indignation, scorn and contempt. I can despise in a way impossible before. To think and to say inwardly that my antagonistic is a — fool vent-my feeling, sometimes I pity him and yet know I shall revert to feeling him a fine man. I am usually good natured, but can imagine causes of anger in those I love, but nothing less than their entire annihilation or that of the whole world, including myself, can satisfy. I believe I should have the courage, fatalism, criminality or whatever it be, to follow my impulse of the moment. My capacity for anger has increased with the breadth of my psychic life, but such periods are far rarer and it takes more to rouse it. Now I sometimes feel a sort of pleasure in bad treatment which was expected to enrage me.

3. English, F., 19. When angry I feel all of a sudden burning hot, stifled and compelled to make a noise. I used to strike people, now I strike things. I used to be promptly carried to my room, now I seek seclusion of my own accord. I used to shed tears, now I feel burning and choke till my nose bleeds, then I am better. Sometimes I grow icy cold and feel as if I was all blanc mange inside. This feeling is worse than the heat, for I seem to be a stone. People speak to me but I do not move; question me but I do not answer. They think I am sulky. I am not, but am simply frozen. I awake the next morning with a sense of shame; relief, however, predominates, then I can look at things in the right light and I go around apologizing and setting things right.

4. M., 30. When angry I feel as if my features were distorted, as if it were cowardly not to look the offender straight in the eye as pride impels, although another impulse inclines me to invert my eyes in an embarrassed way. I am conscious of my mouth and do not know

how to hold it, but this gesture makes me feel ashamed and restrained. I do not know how to hold my hands or to stand, but feel conscious of my whole body, want to be left alone, and when I am by myself I relax from this strain, then I seem to go all to pieces. I collapse, flop down all in a heap, suffer chiefly from mortified pride, feel that I could do almost anything rash, but from this state of utter abandon to later self control I get back in time. When angry I never can talk without crying.

5. Scotch, F., 22. I feel when irritable like a volcano liable to burst forth at any unconscious touch. I used to feel on fire inwardly. It is most painful and urges me to break or knock something down. A casual remark or even a most trivial happening increases it. I do not scold or rant but gather up all my force into a few cutting, cruel words. There is always a faint background of knowledge in the very height of the storm, that words remain forever and that the good Lord I profess to follow disapproves; but all these are beaten down and although I know that my words hurt both others and myself, I must utter them. From about 12 to 16 I would do almost anything to wreak vengeance, often striking people. I feel quite capable of killing a person. Even now I sometimes fear I shall do so, although as a rule my rage vents itself more and more inside. The humorous side of my anger often strikes me afterward, and then its sting is removed.

6. A girl of 10 became so angry because detained after school that she lost all control and gave up to a fit of passion. Her face became very pale, then flushed to a dark red, purple spots came and went on her cheeks and forehead, she writhed, twisted, screamed as though in bodily pain, and at times was almost bent double. At other times she would sit still a moment, gasp, shudder as if to choke, and then begin to scream again. She seemed to be sick to her stomach. She never showed any regret. She was once very angry at me and will always dislike me.

7. M., 44. When huffy or in a tantrum, a man I know has a vein in his forehead swell out large; a woman of 60 lengthens her upper lip; a woman of 25 pushes forward both lips; a college girl I know stiffens her under jaw, her eyes grow glassy, she raises her head, walks stiff and erect, talks in a jerky way which she calls sputtering. Hop-ping mad is a phrase literally correct for some.

8. M., 39. In some, I know, anger makes the face white, the features are set, then a chiselled look will appear beautiful in a way. Others pitch their voice low and speak more slowly and distinctly. The face of one child I know is completely changed. He looks wicked and like an animal. I have several times seen this, it haunts me and I hope I may never see it again. The cause in this case was unjust and ill judged punishment.

9. F., 21. I saw my little wiry music master, a man of 70, thoroughly angry once at my wrong and careless playing. He danced all around the room, stamped, shouted, stammered, and left the house unceremoniously. Some friends passed him around the corner rushing and muttering. At his next visit, mother asked him how I was getting on. He said I was doing splendidly and was his favorite pupil, and that he liked to have me give him trouble, because it showed that there was something in me.

10. F., 20. A sensitive, overworked middle aged music teacher, with keen artistic nature, when angered by laziness or conceit in his pupils, becomes extremely and frigidly polite,—by this, by his sarcasm and a slightly strained laugh, his indignation can be detected. Strong as his temper is, he has it under such control that a spectator would not suspect it.

11. M., 31. A most tempery women, I know, with a tremendous.

will, which if crossed makes her talk rapidly and recklessly. Her eyes flash and I have known her to kick people and strike them in the face. She seems like a dog run mad. If she really hurts people or they are quite upset, her rage instantly goes, and she is as tender as a mother, but afterwards she has a bilious headache. She often justifies her acts afterwards in cold blood.

12. M., 21. The best case I know is a woman, who overwhelms people with abuse, sometimes flies at them, becomes hysterical and then sulks for days. Once she resented her sister's language and destroyed every present she had ever received from her. She considers her temper a matter of course and seems to make no effort to check it.

13. F., 17. An ugly little Italian girl of 15, with beautiful hair like spun silk, of which she was inordinately vain, flew into a rage terrible to witness when it was towed, which the girls took delight in doing. She said little but a terrible demon seemed to seize her and drive her into a passion. Every vestige of color left her face, her eyes glittered and her expression was almost inhumanly wicked and cruel. With one quick look at her tormentor, she would spring at her with feline alertness, and generally left distinct marks of nails and teeth. I never saw signs of regret. "It is to be hoped that her face was covered with blessed shame and that humanity suffused with cooling streams that fiery spirit."

14. F., 38. When angry my face grows pale, but dark about the mouth. I feel numb as if my circulation and physical functions had received a shock. The angrier I am the tighter grows the muscle tension everywhere. Every attack of anger is followed by constipation and urinal continence, also lack of appetite, thirst, nausea at the very sight of food, and also an acute bilious attack. Nausea once lasted six months because I had to sit at the table with the object of my anger; no monthly sickness in all that time. It is ten years since, but the sight of that person still brings on a feeling of anger. Of contrition I know nothing.

15. I saw a gypsy man and woman fighting, screaming, and using the most awful threats. They tried to bite, choke, seize each other in all tender parts of the body, and seemed not human but wild beasts.

16. F., 34. A South African girl, if told to do anything, instantly and ostentatiously disobeys, and calls a long string of names. She reminds me of Angelica in the Heavenly Twins; is honest, affectionate, generous, fond of mad pranks, is capable but hates work, and sits for hours doing nothing.

17. Am.; adult; female. "I do not remember getting violently angry but once. A friend of mine spoke unjust words of a neighbor of whom I was fond. I stood it for a few moments, then I commenced to talk. I could not say things sarcastic enough. There was a lump in my throat. My eyes felt as though they were open to their widest extent; my face was cold; breathing rapid; muscles contracted, and my hands were clenched. I scarcely heard anything. In an instant all this passed. The blood began to be pumped up through the arteries in the neck in powerful pulse-beats and my heart seemed to fairly jump. Gradually the muscles relaxed and a feeling of extreme fatigue came on. I could scarcely walk home I trembled so. When I was in my own room the tears flowed copiously. For a time I was almost afraid of myself. That night there seemed to be something pushing me on which I could not understand. I was very tired when this occurred."

18. F., 38. I teach a boy of fine American parentage who, when reprimanded, parts his lips slightly and looks me straight in the eye a little as though he were laughing at me. When I call him he comes, but sets his teeth, bends forward, clenches his fists, tries hard to speak but cannot utter a word till he cools down and then he stutters,

which he does at no other time, and at length the tears come. He is very bright, excels in study, likes and quotes me on all occasions. He is much worse at home and his mother fears he may become a murderer. He never shows regret.

19. F., 19. A girl friend has a peculiar sneering smile, which curls her lips, and no rebuke or threat can alter her. There is a peculiar contemptuous expression in her eyebrows. Her silence is dogged for days, it is as firm as a rampart against friends or foes. It ends in some burst of defiance and is usually roused by blame. Severity increases it. This disease the poor patient seems to inherit from her father.

20. M., 30. I know a young man of 24 in the West, who is well, strong and sane, whom I have seen repeatedly go to the corner of a ball-room and lie on the floor and pound his head on it and roll from anger, because another man danced with his best girl. He drives cattle and sometimes literally cuts a pig open with his great two-handed hog whip, or rides up to it on his broncho, seizes it by the hind legs and dashes its brains out on the ground. He is generally voted a good fellow, says little and never attacks human beings, but only writhes when angry.

21. F., 24. My former chum was a well-born girl, but without discipline and could never be crossed. If this occurred, she seemed at first astonished and then frozen up with rage. She stood once two hours without moving hands or feet, her head thrown back and a fixed determined look in her eyes.

22. Pure anger makes me creep from head to foot. I never want to have it out with any one or be revenged, but feel haunted and discordant for days. I must be alone, and have my door locked, with no possibility of intrusion, and often pile all the furniture against the door and then sit or lie down to have it out, or perhaps cry myself to sleep.

23. F., 21. When I had once lost control of myself, I wanted to push away everything that happened to be near, to make myself alone, where I could muse on my wrongs and grumble to my heart's content. Whoever happened to come near had to bear the brunt of my growls and hear everything and everybody described in the blackest of colors.

24. Eng., F., 21. In rage some people undergo an entire change, and their eyes grow large and set, the face is rigid, they contract the brows. Some vent it in violent motions, in quiverings of the body, compression of the lips, or bad words.

25. F., 19. I have seen men ordinarily sensible speak with cruel sarcasm and grow absolutely infantile, diffusing bitterness all about, and at the smallest provocation in a game of croquet.

26. A lady of 40 occasionally loses all control. She slaps, dances, says the most cutting things, for she is a woman of remarkable intelligence, but never shows any compunction.

27. My girl when angry is almost insane and acts like one possessed. She attacks anybody, breaks windows. Her second dentition seemed greatly to aggravate her temper.

28. F., 39. A girl of 11 when provoked throws down whatever she has and rushes at her enemy. She is hot, her teeth are clenched, and she usually goes for their hair, and when carried away, she stamps and cries boisterously.

29. M., 22. When maddest I used to sulk, make faces, stamp upstairs, my neck and ears would burn, my teeth grind, my fists clench, and although I felt contrition sometimes, could never show it.

30. M., 29. A girl of 17, humored and sentimentalized can bear no cross to her inordinate conceit. Her anger makes her eyes set and glassy, and she does outrageous things and ends always in sulks with no remorse.



31. Eng., F., 23. Some show temper by being bearish and boorish, others swell up and strut, will say or speak to any one, or give snappy answers. I think that rage makes red people white, dark people browner, and pale people pink. The better the complexion, the greater the change of color.

32. F., 36. I can recall but three violent experiences of anger. I felt pent up and congealed, then the worst of my nature came out. I got dizzy and my head felt very full. I seemed to tremble inwardly.

33. F. 25. Anger makes me hot, sticky and sweaty. I talk fast and loud. In extreme cases only do I completely lose all self control. It always ends in a shower of tears.

34. M., 18. When very mad I used to shut my eyes. There are some people I long to maul unmercifully, also cats, of which I have a most particular hate. The boy I am maddest at has separated me and my best girl, probably forever, and I am laying for him, if I have to hang for it.

35. F., 20. The slightest provocation in the way of getting worsted in games, or being forced to do hated things, made me scarlet and crimson. I still long to break out but something restrains me. I cannot bear to have any one speak to me in this state, and if they do am likely to burst forth in a torrent of tears. My reactions are usually penitence and fatigue.

36. A colored deaf mute, a boy of 15, slow mentally but well developed physically, resents everything, but most of all, allusions to his color. He shakes his fists, his eyes bulge, his upper lip is drawn from his eye teeth, he grows blacker, draws his fingers significantly across his throat, and his gestures and threats are terribly in earnest, but it all goes off in this way and he harms no one.

37. F., 21. There are no special causes or times that put me in a temper, and yet I sometimes have to walk up and down on tip toe or march back and forth in the garden or brace myself to sit still, feel every nerve and muscle stretched to its utmost tension. Sometimes when I am angry at people, I incline to do all the little nasty things I can think of to them, and the more angry I am the more lacerating things occur to me. Sometimes I cannot say these things, but fear that I may do them.

38. One bonnie merry Irish girl has spells of mood, during which she hardly speaks, but her moods are so separate that in one she rarely refers to the others.

39. F., 19. When alone I roll, wriggle and weep, but keep up a kind of philosophizing all the time as to how the object should be treated when we met.

40. F., 23. When my hot and furious temper culminates, I tremble, am cold, and speak out recklessly the first and bitterest things I know.

41. F., 19. A girl I know bursts into a flood of passion and must make a noise in almost any way, then she passes into the sulky state, and it takes a day or two for all to vanish.

42. M., 31. I know an impatient person who first fidgets, nostrils begin to twitch, eyes glare, voice is raised to a crescendo and after the acme there is a diminuendo, as the rage subsides. I know some whose chronic state of mind is sour and nothing is right.

43. Am.; adult; female. When I get very angry my face grows white, and it seems as though a cold hand clutches my heart. I grow faint and dizzy, and see green and black and red all whirling together. My breath grows short and my body gets limp. There is a distressing feeling of nausea. If a person ill treats me further, I rouse up and feed him sand, whereupon these symptoms disappear.

44. A boy of 14, the terror and leader among the inmates of a State reform school, when angry looks the person, officer, superintendent,



or whoever it may be, firmly in the eye, calls him the vilest names, is outrageously profane and attacks them like a mad man.

45. F., 23. If I could not have my own way when I was a child, I would scream and jump up and down. There was no control until I was about 8, when the form of my outbursts became tears and angry words. I had to do something when in a pet if only to rush about.

46. F., 26. My temper takes the form of taking things amiss and not being pleased at anything, am silent and gloomy, with a feeling as if my head was fixed in a vise. This symptom is a warning and the sensations are so painful that I make a desperate effort to keep pleasant.

47. My mother is a most warm hearted and affectionate woman, but when angry says very cruel things, which one does not like to think of. She has not been the same person since my little brother was born, and imagines injury where there is none, and broods over and nurses her wrath to keep it warm. My father too is hasty and like a great child in the way he takes offence, but he does not brood like mother. I have inherited his type.

48. F., 30. I have no feeling and no mercy, but will have my own way and prevent others from having theirs if I can.

#### A few typical individual outbreaks:

1. A big girl in a country school told me to get up and give her my seat near the fire, and when I refused she sat heavily in my lap. I could not push her off, and soon without willing to do so, found my teeth set pretty deep in her back. How often I have wondered if I did right. The question loomed up into big proportions and haunted me. I thought over and over again, "she was biggest, I had the seat first, what else could I have done," etc. I cannot tell how great this question grew or how it hung like a pall over my life for years.

2. F., 45. Once I was angry with God. It was too dreadful to recall; a sense of helplessness, the futility of reviling or opposing him, and this added to the horror. I was ill and could not hold my peace, but had to look up to the sky and blaspheme. My brother had a similar experience and told me that he felt as if the foot of a giant was on his neck. I told a clergyman, who called, to leave the house, that the Bible was a volume of lies, and God was the worst liar, for he had deceived me all my life. I have repented since and trust I am pardoned.

3. M., 40. Once I was said to have pushed down my brother, who was badly hurt, although in fact I was at the other end of the garden. I would not say I had not done it, and so was kept in bed two days. During this time I read Gulliver with delight, but a strong background feeling of injustice was always associated with this book. I am still angry at every thought of this, although usually I am quick over my tempers.

4. About my last rage was at the age of 13. I was in bed, and my sister was long in undressing, and then left the lamp in the farthest corner for me to put out. We quarreled fifteen minutes; then I put it out, but when I got back to bed, pinched her, when a fight ensued, which resulted in both of us sleeping very uncomfortably at the opposite and cold edges of the bed with a bolster between us.

5. F., 48. In youth I took refuge from the very few crosses of my very guarded life in pride. The first real anger was at the age of 42 at an act of injustice to my son, which stirred me fathoms below all previously known soundings in my nature. Each time that I permitted myself in the sanctity of friendship to discuss the matter, a singularly vile taste would arise in my mouth followed by extreme nausea.

That mighty maternal instinct of protection, which runs through all higher animal creatures, has since then been far more clear to me.

6. F., 41. My older brother teased me until I said I wished he was dead. As soon as I had said this dreadful thing, I was terrified lest a judgment from heaven should fall upon me by causing his death that day. I watched anxiously when he returned from his work and recall my remorse far more distinctly than I do the anger.

7. M., 24. I began a boyish fight which lasted nearly an hour without anger. It ended by my enemy falling and pretending to be dead. I believed he was and felt exultant and perfectly satisfied and happy. Left him lying at the fence corner and went home. Knew I must suffer at the hands of the law, but was fatalistically resigned.

8. F., 46. When I was ill and the doctor came to tell me of my brother's death, I struck him with all my might; and all that is usually grief seemed for the moment turned into anger.

9. F., 24. My last great rage was eight years ago at my brother who hurt my cat. I rushed at him, screamed, thumped him with both fists as hard as I could, then I ran out of the room, cried, felt ashamed, pretended to act as though nothing had happened, and for a long time felt hot and miserable, for my brother kept alluding to the wounds he said he had received.

10. F., 45. A slum boy lately struck me in the face with his fists. My face grew icy cold and all my muscles got tense. I felt my lips white and wanted to hurt him physically. I could have done it, although he was a large boy, and should have done it but for my dignity as a teacher. I wanted to put him on the floor and pound him.

11. M., 37. My present temper is of three sorts—first, actual passion; second, impatience or ire; third, sulks. Of the first I can recall but two instances. One was when my little brother would not stop teasing me to show him something when I was very tired. I broke out in words and was checked by the look in his face. I could have cried as I could at this moment in remembering it. When a friend urges me to do something I abominate, I have several times measured strength with him.

12. M., 23. Once when I was about 13, in an angry fit, I walked out of the house vowing I would never return. It was a beautiful summer day, and I walked far along lovely lanes, till gradually the stillness and beauty calmed and soothed me, and after some hours I returned repentant and almost melted. Since then when angry, I do this if I can, and find it the best cure.

13. F., 43. When about 4 my brother shot an arrow at my candlestick, this made me so mad I ran out of the house and hid under a hay stack, resolving to make him miserable by being lost, and determined to die from starvation.

14. F., 20. I offered a doll to my little niece and when she reached for it, I took it away and told her she could not have it. It worked like a charm, and when she was brought up to the proper pitch, I took the following notes—face very red and swollen, two deep wrinkles between the brows, lips firmly pressed together but later open to their full extent, when she began to scream at the top of her voice. She stamped, kicked, tried to slap me in the face and clenched her fist. Later but not at first the tears came and she sobbed as if her little heart would break. Next time I shall study her laugh which will be a pleasanter task.

#### I. CAUSES.

\* The following cases selected and abridged from many are typical and suggest that women have more provocations than

men, but usually practice control better, and how courtesy, respect, sympathy, consideration, kind and fair treatment of others and even of animals may remove many of the incitements to it.

1. F., 20. The painful feeling at the time and the self scorn afterward make angry experiences hard to recall. The chief causes are contradiction, especially if I am right; slights, especially to my parents or friends even more than myself; to have my veracity questioned; the sight of my older brother smoking when we are poor; injustice, dislike or hate from those who fear to speak right out; being tired and out of sorts, etc. In the latter mood the least thing like finding books out of place; loss of step when I am walking with some one; indignity to a poor girl by the teacher; stupidity in people who will not understand—these make me feel as a cat must when stroked the wrong way. Injustice is the worst and its effects last longest. To be distracted at my work; unpleasant manners and books; hunger and cold; to be treated as if I were of no account; flies that will keep lighting or buzzing around me; to stub the toe or have it stepped on; to forget things that I want to remember or to be unable to find things; when my bicycle hits a stone; to have lost a button or have my hair come down; to have a pin come out or my clothes rip; these things make me more petulant.

2. F., 26. People more than things or events arouse my temper and some have far greater power to do so than others. Their mere presence is so irritating that it requires a great effort of control and my aversion is often apparent to others. Life with such persons would be intolerable, and would bring out the worst side of my character. Special causes are narrow mindedness, cruelty to animals, slander, obstinacy in thought and deed, want of sympathy or sometimes a trifle unnoticeable by others, touches the sore spot, times of ill health, being forced to do over what I had done as well as I could before, times of low spirits which with me alternate with high. I pay too much attention to details without grasping the whole, and this makes trifles irritate me. I jump at conclusions and hence am often angry without cause.

3. F., 29. Whatever limits my freedom of action or thought is the strongest stimulus to wrath. I was royally mad at my sister because she did not resent an injury. I can deny myself as much as others can, but cannot endure to have others cross me. I was never madder than when my brother would make a noise, when our mother was ill. My causes are girls talking out loud and distracting me in study hours; to be accused of idleness when I have studied my hardest; blamed for what I did not do or did, or my health being below par. Sometimes when I am happy, I am more easily angered than when melancholy, because in the latter case everything looks gloomy, so that one point more or less makes no difference.

4. English, F., 22. I have a great variety of tempers, especially of the irritable, jealous, sulky violent kinds. The violent kind is caused by injustice to others or extreme flat contradiction, or when my favorite, deepest feelings and will are thwarted. The irritable type comes from smaller stimuli like being kept waiting, being hurried, having my skirt trodden on, density in others, etc. Health also affects it. Jealousy is caused by those I dearly love preferring others. Sulks are due to neglect or injustice or impertinent coldness. All these types except the irritable are more under control than in childhood.

5. F., 20. If accused of doing what I did not, and especially what I abhor, I am so angry that I tell my accuser that she would do the

same. If I am hurrying in the street and others saunter, so that I cannot get by, or a person I like makes fun of me, or when given a seat in church behind a large pillar, I am provoked, and the more helpless I feel the more ungovernable my temper becomes. Opposition enrages me, so does a discordant note in music, especially if repeated.

6. F., 23. My lines have fallen in such pleasant places, that I hardly know how anger feels; yet injustice does rouse ire which I call righteous. Sometimes I take up cudgels in behalf of imaginary sufferers and work myself into a state of passionate fury. In such mental inflammations, epithets and phrases suggest and form themselves with dreadful facility, and I express myself far more easily than at other times. Sarcasm and criticism are such a relief. If people are perfectly unjust, I can treat them indifferently, but if there is a spice of truth in what they say, I am much more angry.

7. M., 34. When despondent the worst thing is to have made up my mind to do something and failed. Being angry at myself, I am consequently so to all who speak to me. Frivolity in others, asking needless questions, attempting to cajole or boot-lick the teachers, rouse me; so does doing what I do not want to when I vent rage by doing it in a slovenly and discouraged way. Self gratification at another's expense, cruelty, being deceived or trapped, or when dignity, self respect or common courtesy are outraged.

8. M., 28. Am often angry with myself caused by my own faults, my jealousy of friends, so that I can rarely rejoice at another's success. This is bad and I fight but cannot overcome it. An over tidy relative always slicking up my things, the necessity for hard cramming for examination, interruptions, being laughed at is perhaps the worst of all. Being asked to give or do things when I am just ready to do so of my own notion, having my school work soiled.

9. M., 19. My causes are being beaten in an argument, when I know I am right, being misunderstood, being kept waiting, and worst of all being told I am stupid and ought to know better, especially if it is true, being accused of cheating at games, although it takes many such little aggravations to bring me to the boiling point.

10. F., 48. In my teens very divergent opinions or beliefs made me angry. I blush, throb, grow stiff, and have a peculiar whirling sensation in the head. If I differ in argument and cannot convince my opponent, or if he says what is false or strained to prove his case, or worst of all jealousy makes me short, sharp, crusty, and pale and savage in looks.

11. F., 22. The causes of my anger are if people act against reason or their better knowledge, or lack moral courage, pandering of all sorts, seeing nobodies patronized, slovenly work, want of system, method and organization, being expected to do things without the means or conditions, sudden emotions and meanness.

12. F., 25. My causes of anger are slowness in others, being kept waiting and expectant, or being slow myself when I want to be quick, when I am angry at myself. Another cause is if others are dense and wooden, if my curiosity is aroused and not satisfied. Perhaps it may all be resolved into my not having my own way.

13. M., 27. I am angry at late risers in my own house, stupidity, disappointment in some fond hope and feeling pushed and hurried. Any kind of reproof is most irritating. To sharply deny people what they want is the best means of arousing their temper.

14. F., 14. My temper is worst when I see a girl put on airs, strut around, talk big and fine. I scut my feet and want to hit her, if she is not too big. Jealousy at hearing others praised as I think unduly as paragons, or having my own nature dissected or discussed, is most irritating to me.

15. F., 22. Aggression toward the weak, stupidity, obstinacy, lying, deceit, and a sense of impurity. A person I neither love or hate would have a hard task to put me in a temper.

16. F., 36. One chief cause of anger and even fear in children would be removed if we did not begin their training with don't's. Sympathetic and positive indications, if wisely administered, cure me.

17. F., 46. When a playmate said her mother was better than mine, I tipped over the table in her house, rushed home, and was so confused that I fell down stairs, was more controlled afterwards.

18. F., 14. If I am made to stop reading a story in the most interesting part to wash dishes or mind the baby, I have to squeeze something very hard or make faces, and sometimes when very mad, I laugh.

19. F., 14. What makes me mad is if I have a bad headache or my brothers and sisters get to fighting, or all turn and plague me when mother is gone. Sometimes I hit and sometimes say a prayer to myself, and try not to mind it.

20. F. With me it is the worst and the commonest cause to feel that I have more to do than I can, to hear gossip about neighbors.

21. F., 29. When tired, I am irritable and fret at little things, and all my life have felt that I was not understood. This causes me to brood. If I am excited from having enjoyed myself very much, then I am easiest angered.

22. F., 31. To be crowded or jostled, told to do something by people who have no right, to see slovenly work, to be ridiculed, spied, tattled about, be detected in wrong doing, is my chief provocative.

23. F., 19. Harping, nagging, gloating over one's own or others' wrongs, rouses me and I give my friends the benefit of my thoughts with a great deal of volubility.

24. F., 29. Term time with regular work is better for temper than vacation when all sorts of things may turn up, and when there is not system, yet some are most irritable when working hardest.

25. F., 30. Tittle-tattle, petty talk and gossips, flat contradiction, interference with my rights or affairs, impertinence, constant interruptions, practical jokes, idiotic laughter or anything unjust.

26. M., 26. The most provoking things to me are real or fancied slights to those near me or myself, for I have great pride which is easily wounded.

27. M., 22. If indigestion, which is a form of irritability, is temper, then I often feel it. I am easiest angered in the morning, but later in the day can face difficulties with far more equanimity.

28. F., 35. My childish tempests of wrath burned hottest when my grandfather used to trim or cut down trees or even shrubs. I told him God made them that way, and he had no right to hurt or change them.

29. F., 20. Teasing I never minded, but rather enjoyed, but to snub or talk down to me in a top-lofty way arouses all my ire.

30. F., 31. If people I care for say unkind things, it hurts me so I seem to turn to stone, and it seems as if I can never love them more. This rankles. I can recognize one distinct type of my threefold temper, which comes from my mother.

31. F., 21. To have to do a great deal of unnecessary work, which my people invent to occupy my holidays, makes me maddest. I speak sharply, and I have reasons, for I am not a naughty girl, who needs to be kept out of mischief.

32. F., 44. When boys use vile language in my presence, I want to smack them across the mouth. Cruelty to objects incapable of resistance and injustice to children rile me intensely.

33. F., 39. Familiarity, which I have not evoked, discussion with those who have not even tried to understand my point of view, to hear

myself talked about or discussed, even by my parents, is insufferable.

34. I am more indignant at what people say than at what they do. When nasty things are said, I lose control of my tongue and must say what comes into my head at the time. I hardly know what I am saying, but it all comes back later.

*Spontaneous Anger.* I think we must admit that sometimes this really occurs, although it is a very interesting and uncertain question. Prison and other records show that people in confinement sometimes break out into fits of destructive rage with no apparent cause. Of course dislikes may deepen to antipathy and aversion, till not only every act whatever but the very presence of certain individuals may irritate to the point of explosion, and there may be a long summation of petty vexations, but it would seem that our organism is so made that this form of erethic inflammation may reach its fulminating stage without any cause assignable by the subject or observable by others. Sometimes purely imaginary wrongs to imaginary people excite intense moral indignation. If there are spontaneous cases, they cannot be entirely explained by love of this kind of erethic state as such, but may be due to the necessities of growth or over lability of nerve cells or centers. The satisfaction and real physical pleasure too that sometimes follow anger suggests that it has its place in normal development. Running amuck is sometimes described as spontaneous, like rabies. The determination of this question is like the problem whether crying and some movements of infants and animals are reflex or due to purely efferent causes, is at present insoluble nor is it crucial for the Lange-James theory. Platner, as we saw, thought some forms of mania were best characterized as prolonged anger without observable cause, and the Berserk rage it was thought was sometimes unmotivated. Michael Angelo is described as chipping down a block of marble to the rougher outlines in a veritable rage, and I lately read of a man and wife in court for fighting who agreed that they were peaceable and affectionate but had to have a bitter quarrel every few weeks over nothing to clear the air. Play and mock fights often contain a little repressed anger and are good to vent it harmlessly.

1. F., 23. When I was 17 I had a long spell of irritability, was unhappy, and it gave me pleasure and satisfaction to make sarcastic remarks. My weakness is impulsiveness, which makes me unfit for a responsible position. I try to lay good foundations of belief and get more settled feelings for my own determination.

2. M., 41. A girl up to 17 in good health had fits of anger with great regularity; about once a month she was violent and lost all self control. No small vengeance was her desire, but no less than a passionate desire to kill the offender. Hatred shown by looks and gestures was intense, and the fit might last a week.

3. F., 7, whose mother calls her every endearing name, while describing her way of sitting, eating, speaking, etc., suddenly passes



to a rigid state, and she once on recovering from this vented her spite by cutting off all the leaves of a century plant.

4. Girl of 3 was eating lunch, when suddenly, without discernible cause, she cried out, tipped over her milk, rose, threw herself face down upon the floor, screamed, kicked, beat the boards.

5. A boy of 14 was sitting in school dreamily gazing out of the window when suddenly his face clouded, and scowled, and he struck his fist on his slate and broke it. The loud noise and the teacher and the school brought him to himself. He could give no explanation except that he felt mad and must strike something.

6. M., 31. When a schoolboy I was a great fighter and if I had not had a battle for some weeks was literally spoiling for a fight. Once I went to the barn and pounded a poor cow chained in her stall for relief. Teasing and bullying used to relieve it. I sometimes pounded a rock behind the corn-house with a sledge hammer.

7. M., 25. Anger often helped me out in my work. In chopping wood, mowing, and other things requiring great effort, I could scarcely help gritting my teeth and getting mad with the object. I used often to find myself helped on by anger at sums, knotty translations, etc.

8. M., 37. (Once assistant physician in a lunatic asylum.) I knew an epileptic case where the patient, a colored man of perhaps 25, had fits that seemed to be nothing but spells of blind rage. He would attack every one, destroy everything and injure himself till he became unconscious. He felt the symptom beforehand and was put in a padded cell.

*Personal Antipathies Based on Physical Forms and Features.*

While these dislikes sometimes are intense enough to generate anger, their chief effect is to raise the anger point, so that a far slighter stimulus is necessary to produce the explosion than in the case of those who instinctively attract each other. From very copious collections of questionnaire material for a very different purpose, it appears that children and young people are very prone to detect resemblances to animals in faces, and often see persons whose features suggest the monkey, dog, parrot, pig, cat, mule, sheep, rabbit, owl, fox, lion, etc., and therefore become objects of special aversion. In another series, prominent or deep set eyes, shortness of stature, cowlicks, ears that stand out, too prominent chin, brows that meet, large feet, high cheek bones, pug nose, Adam's apple, long nose, small chin, prominent, large, dirty or otherwise exceptional teeth, pimples, red hair, light eyes, thick lips, a stub thumb, bad breath, bleary eyes, freckles, fatness, leanness, birth marks, deformities, are features any one of which may evoke immediate antagonism and put the mind in a critical attitude, so that with reference to persons possessing these peculiarities irritability exists side by side with great good temper for those who are physically attractive. Girls in particular often single out some one peculiarity with respect to which they are especially sensitized, and in some cases are provoked to active hate in a way that suggests the converse of the fetishism common among sexual perverts. It is difficult often even for the subject to



analyze the cause of these repulsions and they are sometimes quite unconscious and instinctive.

F., 21. I am a great person to take likes and dislikes; and if the latter, can see no good points in the person. I often judge wrongly and sometimes can conquer my aversion, but it often recurs.

F., 22. My little brother is like me in taking unaccountable aversion to things and persons, especially the former, *e. g.*, a new suit. I have an insupportable aversion to share my room with certain people with whom I like to go around with well enough, so too I cannot see sick people without anger, unless I love them passionately.

F., 19. I believe some persons have elements about them that tend to always keep others bad and others in a temper. The more I like people, the more it takes to make me angry at them; and the better my health, the stronger must be the provocation. Examinations make me spiteful toward the very rooms where they are held, and here some of my worst scenes with Apollyon have occurred. Generally I can stand any amount of banter, but sometimes a little brings a storm on some luckless head.

*Based on Peculiar Acts or Automatisms.* In this list we have snuffling, lipping, making faces, swallowing, rolling the eyes, peculiarities of voice, accent, intonation, inflection, sighing, shrugging, the kind of smile or laugh, motions of the head and arms, gait in walking, posture and carriage, hiccough, stammering, and bad manners generally.

*Dress and Ornament.* Ear rings in men to 130 women out of 679, are objects of intense and very special abhorrence. Thumb rings, bangs, frizzes, short hair in women, hat on one side, baldness, too much style or jewelry, single eye glass, flashy ties, heavy watch chains, many rings, necklaces, and a long list in this class show how dominant unconscious forces are in mediating dislike, which in some souls needs little intensification to settle into permanent hate. Not a few young women state that they could never lead happy married lives with the possessors of these peculiarities, no matter how many good traits of body and mind atoned for them, and the presence of persons possessing them is described as a constant source of irritation, sufficient in itself to spoil the temper. Special aversions of this kind must, of course, be the results of considerable development due to frequent or continued exposure, and it is plain that in some cases the antipathy is created by association with other disagreeable qualities. It would be interesting to know, what our data do not show, whether these traits are conspicuously present or absent in those who detest them, for it might throw light upon the question whether similar or complimentary characteristics repel or attract.

*Habits.* Another class of instinctive aversions for which some minds develop sore, irritable spots, are certain habits like smoking, eating onions and garlic, untidiness in dress or toilet, want of punctuality in rising, meals, engagements, etc., too

rapid or too slow movements, gossip, cowardice, too great bashfulness or familiarity, lying, stupidity or density, selfishness, cruelty to animals, injury to flowers, trees, property, etc., meanness, flattery, affectation, disorderliness, too great primness and preciseness, excessive poise and reserve or deliberation, imposition, laziness, pandering, criticism, cheating in games, and bragging. While individual experience in many cases exposes individuals more to one of the above chologenic agencies than to others, there are undoubted indications of a tendency to rutty specialization here, so that if education may be defined, as I suggest it may, in part, as learning to be most angry with those things that most deserve it and maintaining a true perspective down the scale, most of our correspondents are not thus educated, and we have here another example of the *res augusta domi* of the mind for which heredity may in part account, but not wholly. The above miscellaneous qualities might be classified as æsthetic and moral. The deliverances of conscience and a good taste are, however, here particularly interrelated. Righteous indignation at unethical acts shades by imperceptible gradations into the milder verdict of bad taste, but even the latter is not without significance as a predisposing cause of anger.

*Limitations of Freedom.* Liberty is a precious possession and sedulously guarded by instinct. It is the indispensable condition of the completest and most all sided growth, and cannot be too carefully cherished. In an atmosphere of repression and of *dont's*, temper usually suffers, while one of the best cures of habitual anger is liberty, and complete occupation is often a preventive to it.

*The Thwarting of Expectation or Purpose.* When a story breaks off at the most interesting point and the mind is left in suspense, or when children are called away from stories just before the dénouement or games before the crisis, when they are kept waiting or if curiosity is especially aroused, or they are fooled and deceived, which is one common form of teasing, or if adults fail to realize the plans of their youth, the anger diathesis is called into play. In fact science, which is prevision, and consists largely in eliminating shock or the unexpected, has as one of its functions the reduction of this chologenic factor. Sudden fright, the blocking of a path or doorway by an obstacle, the stubbing of the toe or running into a post, are perhaps physical analogues of the same thing. We might laugh in some states, if Spencer's theory of a descending incongruity is correct, but we are more likely to be indignant.

*Contradiction.* Akin to the above cause is that of meeting opposition of our sentiments or ideas. Even when very different views are encountered in friends, especially if they are per-

sistently maintained, as well as when the direct lie is given, the conflict of mind, will or feeling arises, which may evoke the anger erethism. There are paranoiacs to whom not only the thought but the very word conflict<sup>1</sup> or even discussion excites painful symptoms, while the interest in a vigorous altercation or debate, although less than in a slugging match, is very great.

9 *Invasion or Repression of the Self.* Each personality hedges itself about with certain limits which, however widely they may vary for friends and enemies, are more or less fixed for each acquaintance or each mood. While many complain of not being understood, a frequent excitant of anger is being too well known. Hence, prominent among the assigned causes are being spied upon, tattled of, gossiped about, criticised, dissected, analyzed, detected or even reproved. One form of plaguing is to penetrate with undue familiarity, like nicknames, the adytum of selfhood, and mocking and ridicule find part of their effectiveness here. Here, too, belong most forms of impudence from our inferiors and insults from our equals.

*Pride* and a certain amount of self respect is one of the most irrepressible qualities of our nature, so that slights, contumelies and undue subjection or subordination, even slight wounds of vanity that are inflicted by ostentatious disregard of opinions, are keenly resented.

*Injustice.* Not only cruelty to animals or persons taking unfair advantage, but injustice to self, like being accused of deeds or words that are abhorred, abuse of friends, heroes, favorite authors, and in rare cases imaginary indignities to imaginary sufferers, are chologenetic.

*Individual Causes of a Special Nature.* Some describe with considerable detail not only as special provocatives but as causes of distinct deterioration of temper, frequent experiences like finding books, utensils, tools, etc., out of place, persistent attacks of flies and mosquitoes, the perversity of walking with those who will not keep step or habitually lose it themselves, of having the toe or dress stepped on, of being jolted in a vehicle, crowded or turning out the same way in meeting others in the street, or even being touched by strangers, having the hair come down or out of order, the approach of a dog or cat, etc., busy work, being given too much to do, taunts, meanness. Indeed most have sore points or anger zones which may be based on individual weaknesses, or on peculiarities of form or action, or on special experiences of provocation.

*Jealousy.* Jealousy in seeing others preferred by teachers,

<sup>1</sup>See the interesting case described by Dr. E. Cowles. Persistent and Fixed Ideas. *Am. Jour. of Psychology*, 1, p. 222.

friends, acquaintances, or hearing them praised, may cause not only intense misery but angry outbursts.

#### SUBJECTIVE VARIATIONS.

Among these the changes from the general feeling of euphoria and well being connected with good health, which is the best preventive of anger, down to illness and pain, which are its surest promoters, are most important. Some forms of disease and early convalescence are particularly characterized by irascibility, and children who are in abounding health have, other things being equal, perhaps the best immunity from temper. Closely connected with this is the state of rest or fatigue. In the morning after a long vacation, provocation is, as every one knows, far less easy than in the state of exhaustion. Hunger and sleepiness, too, incline to anger, and satiety to good temper. The optimum of temperature helps the disposition, while excessive heat and cold make it fragile. Dentition and menstruation are very important sources of variation of the anger point, which from all these considerations seems to be even more fluctuating than has been supposed. General prosperity and a sense of doing well and getting on in the world, as contrasted with ill fortune and calamity, makes for exemption from anger, as does a general good conscience, settled and tranquil religious opinions, good friends, an optimistic philosophy, sufficient but not too much work or occupation, and in general absence or removal of all the chronic causes of fretfulness. The states of irritable weakness and hysteria are characterized by fluctuating moods, *e. g.*:

*Heredity.* On general principles it would seem that a diathesis so marked should be as hereditary as anything in our psychophysic organism. While our data are far too few for inference, it would seem that inheritance has here a wide scope.

F., 39. My father was never even hasty, but my mother was of a cranky, tempery family. I am for months and for occasionally years, sweet and placid as my father, and then without provocation I have spells of great irritability like my mother's people.

Eng., F., 11. My aunt who brought me up has given me her quick temper. It came by contagion and I think not by heredity.

Eng., F., 18. My father is the calmest and most placid of men. My mother one of the most fiery of women. I am all mother in this respect.

Eng., F., 20. A young man of 20 I have known from childhood inherits great irritability which can brook no restraint, who suffers to the point of tears from wounded pride, can bear no teasing or reproof, directly from his maternal grandfather. It seemed to lie dormant for a generation.

Eng., F., 23. My mother is very irritable. Her father had a whirlwind temper and five of us seven children have it, and in two it seems quite absent.

Scotch, F., 26. One brother, one second cousin, and one maternal

ancestor are very hot tempered like me, the rest have more or less escaped.

*Absence of Temper.* Some seem born untempered, nothing flusters or ruffles them. They are passive, easy, lazy, inert, apathetic, and while often imposed upon are generally liked, rarely teased or abused. Such cases usually lack not only energy, but the power of enthusiasm and capacity for erethic states generally. Too good a temper not only precludes from the luxury of intense forms of manifesting life, but is usually associated with a certain insensibility, lack of self respect, ambition and will power.

F., 39. My provoking good temper has been my life-long reproach. I fear it is, as I am often told, apathy, for I am easy going in matters in which I should take more interest. Then, too, my shyness keeps me from showing what I feel deeply.

F., 21. I am by nature rather unimpassionate and indifferent, have little temper or impulsiveness and rarely get enthusiastic. I do not consider this a virtue, but it is not because I am too lazy to show temper.

F., 28. In good health and happy circumstances, I have yet to see a sour spirited child. I think it would be possible to rear many children in such a way that they would have no experience of anger.

F., 29. I know a girl who never in the world could by any possibility be roused to temper. Her temperament was so inert, she says she cannot get up anger when she knows she ought to. A world of such people, I think, would be very monotonous.

F., 27. I often liken myself to a happy, clear, busy, sparkling brook, rarely interrupted by any one stirring the mud at the bottom. I can be roused, however, and the time before normal conditions recur depends upon the depth to which the mud was stirred.

F., 18. I know a girl of very hot temper, who when provoked does not give way, simply and solely because she is too lazy to take the trouble. It fatigues her to control herself.

*Teasing and the Cry and Anger Points.* Hectoring, plaguing, baiting, worrying and tormenting in all their many forms are largely, though not wholly, motivated by what might be called the psychological impulse to see what another will do under these new conditions of strain or temptation. A German student told me he never felt acquainted with a new man enough to know whether he liked or disliked him, until he had seen him more or less intoxicated. This sentiment is very wide spread, and is akin to Plato's suggestion that counsellors should discuss topics at night, when drunk, and decide them in the morning, when sober; so for many anger removes masks, and what Nordau calls the conventional lies are thrown off and we seem to see the lower strata of what a person really is at bottom alone, or in the dark. Repulsive instincts and habits manifest themselves better sometimes to the common acquaintanceships of years. Temper is tested in many forms of hazing, fagging, etc., to see if the victim will retaliate, how much

provocation is necessary to bring him to that point and what form the reaction takes. If peculiarities of body, dress or manner are salient, these are likely to be sore chologenetic points of attack. Girls who blush easily or are so ticklish that even a pointed finger sets them off, have red hair or even deformities, are particularly tempting to constitutional teasers, who are usually, though not always, cooler and better tempered than their victims. These experiences are really very often educative and develop control in the victim, although sometimes exactly the reverse is true, and tempers may be thus spoiled. Teasers with a strong propensity for practical jokes, playing April fools, etc., who are usually older and stronger, often profess and sometimes really have the purpose of teaching control. When anger is once roused, the goal with some is attained. More commonly, ridicule is then applied which intensifies the rage, and other methods of fanning it to its utmost often give the keenest enjoyment to the provoker. This peculiar pleasure in witnessing manifestations of anger is partly due to a sense of superiority of poise, and no doubt partly to pleasure in witnessing primitive psychological forms of expression, while the factor of cruelty and sport with a victim in one's power is probably the strongest motive of all. The tormentor chuckles, his eyes sparkle with delight, he claps his hands, dances, jumps up and down, rubs his hands, slaps his leg, points his finger, taunts, jeers, yells, calls it fun, and all this tends to egg on the victim to extremes, the memory of which is well calculated to cause regret, mortification, and the resolve for better control next time.<sup>1</sup>

With the cry point, no less variable than the anger point, the case is very different. The tormentor often stops short at this point, and sometimes the mood reverts to pity, sympathy, and regret. This is especially the case if the cry is one of collapse, surrender or real grief, with no impotent anger in it; but the aggravation may be pushed still further with accusations of babyishness in quest of a deeper lying and later reaction, and particularly a boy that has no fight in him is despised.

### II. PHYSICAL MANIFESTATIONS OF ANGER.

Upon this topic our returns are fullest and have been carefully tabulated and compiled with the following general results:

*Vaso-motor Disturbances.* Eighty-seven per cent. of the best cases describe flushing, and twenty-seven per cent. describe pallor as one characteristic of anger. The heart is often immediately affected and sometimes with very painful cardiac sensations.

<sup>1</sup>See Burk: Teasing and Bullying. *Pedagogical Seminary*, Vol. IV, p. 336.



It pounds and bounds, there is a feeling of compression, and the literature elsewhere referred to describes several cases of death from cardiac lesion thus caused. Occasionally some pulsation is felt sometimes painfully in a particular part of the body. In one case in the palm of the hand, another specifies the wrist. In many cases severe headaches with rhythmic intensifications for each pulsation are caused by the general disturbance of vascular tonicity. One woman describes the enlargement and pulsation of the temporal artery as the sign by which she best recognizes temper in her husband and describes a peculiar whirling sensation in the head. Stigmatization over a large V shaped area in the forehead occurs in one case, the face may become mottled, certain local pains sometimes sharp, which attend anger, seem thus best explained as does the dizziness and faintness often mentioned. The nose grows red or blue in one case, the eye balls are blood shot, and erethism of the breasts or sexual parts may occur. In one case the first sign of anger is nose bleed, and if it is copious the anger fit is less violent. Menstruation may be arrested, sometimes suddenly, and other psychic weather signs indicate a more or less intensive vaso-motor storm.

*Secretions.* The glands are no doubt far more closely connected with psyche than has hitherto been supposed, and we shall have no doubt ere long a glandular psychology. Of course the most common secretion is that of tears, which are specified in about 35 per cent. of the returns. Tears may be shed when other symptoms of crying are repressed. Salivation is not only more copious, although in later stages of a long rage it may be repressed till the mouth is described as "bricky dry," but perhaps its quality may be modified from the stomach or otherwise, since in some cases a bad taste is characteristic of anger. Its effect upon mammary secretions in nursing women is very marked, sometimes by way of almost total and sudden suppression, often by some modification of the quality of the milk, so that the infant is made ill. Urinal secretion is often affected rarely by way of suppression, but is commonly more copious, paler and with less deposits. Popularly anger is thought to be closely associated with the liver, and a bilious temperament is supposed to be peculiarly irascible. In not less than a score of cases, attacks called bilious are ascribed as the direct effect of anger. No less frequent results are constipation and diarrhoea, which may at least belong in part here. There is no case in our returns that suggests any modification of the action of sebaceous glands, but in two cases a rash, once said to be all over the body, follows every fit of anger in a child; and in the case of one male sexual secretion attends every violent outbreak. It would be very interesting to know how common this



is, and a collection of facts here might throw valuable light upon Sadism and Marrochism. Sweating may be copious in cases where increased muscular action fails to account for it. Whatever may be true of other emotions, some of which we know to be closely associated with glandular action, there can be no doubt of the relation here.

*Salivation, Swallowing and Nausea.* The act of swallowing somewhat like that of winking is normally repeated at brief but varying intervals through the waking hours. Just how much is due to the summated stimulus of accumulating saliva and how much to the constantly increasing lability of the nervous center involved it is impossible to determine. Of these two factors, however, there is abundant reason to believe that each is independently variable. Many returns specify swallowing, often several times in succession, as one concomitant of the early stage of anger. Occasionally the impulse to swallow is strong but is inhibited, and gagging, lump in the throat, and temporary paralysis are described. This beginning of the peristaltic action that forces food through the many feet of the alimentary tract is, of course, far more under control than the latter stages. The will delivers the bolus of food to the back of the mouth, whence it is taken in charge and propelled by the more reflex mechanism. In carnivora the attack and slaughter of prey is the normal prelude to eating it, and like salivation this movement may be a residuum of an ancient association without assuming any earlier canibalistic stage. The question is how far the momentum of this paleo-psychic association enters into the psychoses of anger, which has as its tap root the quite different impulse of defense and resistance. That it enters, I think there can be no doubt.

Nausea with anti-peristaltic symptoms more commonly occurs near the end or in the reactionary stage of an anger fit, and sometimes acts as the chief inhibitory motive to the impulse to swallow. Its cause here seems to be mainly the fatigue from over excitement or exertion, any form of which may cause it. There seems reason for raising the query, whether these two contradictory functions are so related that if the first is overdone without sufficient stimulus, incipient nausea arises in a compensatory way. If one swallows as frequently and as long as possible without eating and when in the normal state, incipient nausea arises. Swallowing is the act of appropriating the material on which life is made, and nausea means the repulsion or even the regurgitation of it, so that its symbolic significance is great and has been well exploited in both language and in aesthetics.

*Spitting.* In common with other secretions, salivation is often increased in anger, sometimes as would appear with, and

sometimes without, chewing or biting movements. In some of our cases the saliva is copious and runs from the mouth upon the clothes in a profuse and offensive way, and in three cases it is described as frothing at the mouth, and in one as white froth. In the acme of the stress and strain of fighting, this is puffed or blown, sometimes it would appear purposively and at other times unconsciously, upon the clothes or in the face of the opponent. Just what all this phenomena involves is difficult to determine, but it would appear that at least in some cases the drooling in anger is partly due to temporary and partial paralysis of the lips and perhaps of deglutition. Local exhaustion may be carried so far that it would be no more possible to spit than to whistle. To associate the salivation of anger with primitive anticipation of savory food in such cases may seem a long cry, and yet it is not theoretically impossible. In creatures that kill their prey, especially if it is large and involves an erethism like anger, this association may have been established by very long and inveterate experience. Spitting proper begins consciously with what might be described as a t-p movement by slightly protruding the tongue, drawing it in rapidly between the lips and projecting its load of saliva by a slight explosion of air compressed in the mouth after the tongue has been withdrawn and before the lips have closed. Children in the second and third year learn and sometimes practice this. This movement has apparently little utility for the child and is essentially a sign of aggression. It requires much delicacy and co-ordination of labio-lingual movements, and would probably be impossible in a creature less highly endowed with articulatory capacity. It is therefore of special interest. Another mode of spitting, which appears to be later, is what might be called the p-t movement, in a sense the reverse of the preceding. It consists in thrusting out the saliva with the tongue with much breath pressure after the manner common among tobacco chewers. This movement is more difficult and is often practiced with unpleasant results. From the age of four or five years on to near puberty, spitting may be a prominent expression of anger. At first it commonly seems directed toward the face, then towards the shoes, clothes, hands, seat, etc. Contests are described among expert spitters, both as to greater distance and greater accuracy. The victor in a fight sometimes spits in the eyes, hair, mouth, etc., of his prostrate enemy. The folk-lore upon this subject is very voluminous and pertains to the number of times one spits ceremonially upon given occasions, the place, direction, etc. It is, of course, one of the most extreme expressions of contempt and excites correspondingly intense repugnance. Saliva, of course, is a very effective medium of contagion, but the extreme abhor-

rence of the act when contrasted with the attractiveness of kissing, which often involves exchange of saliva and may be contagious, is hard to explain. Of course we have no adequate evidence of sufficiently venomous ancestors of man to sustain an argument that this horror is a toned down fear of virus-bearing sputa. The most that can be said is that there is no positive disproof of it and that the possibility is open. That even the bite of normal man or his progenitors is poisonous to another member of his own species, is unknown. The other possibility is that this abhorrence has some of its roots in long accumulated experience of contagion of morbid germs through saliva without dermal rupture, and that we have here an instinctive prophylaxis against contagion, which has given the folk-lore its character and form.

*Respiration.* Modifications of breathing are among the marked accompaniments of anger. Sometimes deep inhalation, often through the nose with clenched lips, perhaps several times repeated, as the need of increased oxidization deepens; sometimes rapid breathing, which may be through the mouth, and give the effect of panting and occasionally almost gasping, is described. Stutterousness, almost suggesting a snort, purring, snoring, choking, gagging, and sobbing noises that almost suggest hysterical globus—all these cannot adequately be accounted for by increased muscular activity. Whether the type of respiration changes from abdominal to pectoral or conversely, and what the form of the respiratory curves through a fit of repressed anger are, it would be interesting to investigate. Amphibian life requires periods of deep and rapid breathing, alternating with longer periods of rest, and it is not impossible that the preparatory stage of anger symptoms is analogous in some cases to preparation for a long dive with violent exercise.

*Noises.* In twenty-eight young children screaming is more or less fully described as the most characteristic expression of anger. Crying is a language all its own, and as it develops in the first year or two of life the mother or nurse readily distinguishes the cry of hunger, fatigue, wetness, pain, etc., but none is more characteristic than that of anger, which is loud, sharp and generally sustained. A little older children develop sometimes very characteristic snarls, growls, grumbles, whoops, bellows, chatters, bleats, grunts, barks, or noises that sometimes consciously, or more characteristically unconsciously, suggest the cries of animals. Later, occasionally, specific words of warning, threat, defiance, or specific oaths become habitual and characteristic of rising temper. In some children anger brings on a fit of stuttering or a peculiar tremor or staccato, or speech may be interrupted by a noise suggesting a

sob. In older people the voice is perhaps the most sensitive of all the registers of anger. It is loud, shrill or harsh, with variously modified rhythms. Later yet control and repression may develop a peculiarly slow, calm, low, precise utterance which is with difficulty, and not without considerable acquaintance, recognized as a danger signal. One woman almost whispers, with little phonation, but very intense labio-lingual expression, and unwonted relations of these two elements of speech are common. Many become exceedingly voluble, irrepressible and almost eloquent, while some are glum and monosyllabic. Not infrequent is the habit of soliloquy, and many seek solitude in order to find, perhaps in monologue and perhaps in other forms of loud vocalization, the readiest vent for passion. One woman is conscious of no modification of voice in anger except a slight tendency to be hoarse afterward, even when she has not spoken. Perhaps a dozen well-described cases cannot speak or make a noise, but are vocally paralyzed or they cannot speak without crying. Theories of the origin of language like those of Noire postulate a very close connection between the intense muscular tension and loud phonation. The characteristic cry of epilepsy shows the same, as does the battle cries of various savage races. College yells at athletic contests are toned-down cries of defiance.

The close association between anger and noise is seen in many ways. Some stamp, walk with heavy or with shuffling steps, must pound something with a stick or with the fist, or beat a loud tattoo with the fingers or feet. One young woman goes by herself and slams a particular door; a girl pounds the gutter with a stone; a boy throws stones against the loose boards of the barn or against the resonant surface of a large sugar pan. Several work off their anger by playing or even pounding the piano. The gratification in these cases appears to be not solely from making, but also from hearing a loud noise.

*Involuntary Movements.* Of these there is a long list, many of which fall under other captions. Changes of muscle tonus are seen in the changes of the voice elsewhere noted, and in the relaxation or, less often, the tonic contraction of the sphincters, which causes escape or retention of the excreta. Horripilation is sometimes described, the skin becomes rough, and shuddery, creepy, crawly sensations occur. In one case twitching of the skin on the right leg, in one upon the shoulder, and often tonic or clonic or choreic movements of the face and fingers are described. The relation of voluntary to the involuntary activities, which is always a variable one, suffers in anger, and the disturbance and the readjustment is best seen in weak persons with strong temper after it is over, in which

arterial and cardiac tension, respiratory rhythms, etc., are modified.

*Attitudes and Postures.* In anger the body often becomes more or less stiff and rigid, is drawn up to its full height, sometimes with an attitude of pride that suggests strutting, the legs are placed apart when standing, and all the antagonistic muscles are tensed up, so that there is a great expenditure of energy, sometimes with very little activity, along with which goes a feeling of great strength, a difficulty of making correct or quick movements which may otherwise be normal, and which reacts sometimes into the stage of collapse later. Some habitually assume a characteristic attitude when angry, usually erect. Two seek to place the back against a wall, post, or other firm background. Two are impelled to sit and eighteen to lie down, mostly upon the face, and perhaps to roll, writhe, squirm or wriggle. One must throw herself into a chair sideways, in a particular manner, with feet drawn up. The arms are more commonly held down by the sides with slight pronation or supination movements, with fists clenched; sometimes one or both hands are placed against the breast. One young man always thrusts one hand into his coat and the other into his pocket, and probably a large number of more or less characteristic positions could be collected.

*Butting and Pounding the Head.* Many infants when angry and powerless to hurt others, strike their heads against doors, posts, walls of houses, and sometimes on the floor. In this gesture the head may be struck so sharply as to cause pain and crying, but more often it is pounded several times with a violence which would in a normal condition cause weeping but does not now. In some children bruises and discoloration lasting for days results. Occasionally in older children headaches seem to be thus caused. This expression of anger rarely outlasts early childhood, but sometimes persists into adult years, as in one striking case elsewhere in our returns of a young man who habitually pounded his head on the floor when his best girl danced with another. Sometimes the head is struck violently with the fist and quite often, not only in infancy but in boyish fights, butting is a mode of aggression. Some boys love to butt and attain great ability. One is described as running a rod at full tilt and injuring a companion dangerously in the stomach. Another boy practiced butting hard objects to attain virtuosity. Blows with the head are often described as sideways; the forehead or particularly the corner of the forehead, being the point of contact. This is interesting when we reflect on the number of horned species in the human pedigree. Why should man hook like a cow or butt like a sheep or hammer with his head, and that, too, when the skull is thin and elastic,

and the brain so delicate an organ? Surely there is nothing in the present human environment to adequately explain why such an experience, which undoubtedly causes more or less of a shock, can give satisfaction or relief in anger save on the general theory that it demands augmented motor and sensory experiences. Early vertebrates, both aquatic and terrestrial move head first, and there is thus a long ancestral experience of removing obstacles and breaking way through the water with the head. That there is some relation between these manifestations of anger and previous phyletic experience, I think can at least not be denied. In children incipient anger often manifests itself by the threatening sideways nod which very clearly suggests danger and seems to be the residuum of an older mode of going at things. In anger the head is often thrown down and the eyes partly closed as if in preparation, and square nodding in front, especially if repeated and with accompanying pressure of the lips, is a threat. When the fore extremities were engaged in locomotion or otherwise, the head played a more important role in aggression than in bipeds. Often in children we have the opposite anger gesture, instead of going at things head first the head is thrown back out of reach and out of the way of attack. Several boys, however, in our returns seem to be proud proficients in having skulls unusually thick with which they hammer the heads of their more tender opponents, until they cry for mercy; whereas others particularly dread combats lest this part of the organism should be injured.

An occasional expression of anger is stamping upon the toes or feet of the opponent or upon other parts of his body, when he is down. This is sometimes done with the heel and with great cruelty and deliberation. One boy injured for life two fingers of his adversary in this way. Stamping perhaps really begins in the foot movements of infants before they can walk, who angrily kick out with the sole of the foot against persons, the wall or any other object. In older children to stamp the ground or floor is an admonition always to be heeded, for it is a menace of starting to go at the adversary. In many savage dances stamping the ground, sometimes with bare feet and with great force, is an expression of annihilating an imaginary foe. Sheep, some birds, and other animals do the same. In only one case does the child make a movement described as pawing to get at an antagonist; but the writer remembers a case in his boyhood where this was carried to a marked extent, although probably in imitation of bulls. Stamping suggests having the enemy under foot and thus complete triumph. A vigorous up and down movement can tread out life very effectively. Our returns show that soon after learning to walk,



children vent anger thus first with no reference to an adversary, but later looking or pointing to him and thus launching a threat, where often an attack would not be ventured. The first seems quite automatic and unconscious, possibly the noise itself may have been one factor. When there is no alternation but with one foot and repeated, the gesture surely has some unique significance.

*Making Faces.* Violent anger often distorts the features, both by engorgement of blood and changing muscle tension. Often this is described in the returns as bringing out strange, perhaps repulsive and even animal traits and resemblances, and it may extend to nearly every part and feature of the face, modifying its natural hue, bring out veins and wrinkles, and occasionally unilateral modifications. Not infrequently the subject is painfully conscious of looking unusual and of having strange facial sensations, and this and the instinctive corrective impulse often aggravate the difficulty. Although there is very great individual difference in this respect, the face sometimes betrays sentiments almost as delicately as the voice. Many facial movements, too, are unconscious. In early childhood the very common vent of anger is consciously making faces. Our returns do not permit reliable statistical inferences concerning the frequency of the different types of contortion. Opening the mouth and protruding and often moving the tongue, especially out and in, turning the end of it up to show the under side, running it down toward the chin, flattening it, wagging it sideways—are specified and suggest contempt and perhaps insult. Drawing back the upper and the under lip to show the teeth, especially pouting or protruding the lips, stretching the mouth laterally as far as possible, drawing down its corners, projecting the under lip and more rarely the upper one, twisting the jaw sideways, projecting the lower one, drawing in one or both lips, opening and shutting the mouth, sometimes in a gnashing way, a special kind of nasal sneer, and other movements hard to describe that suggest very repulsive smells, tastes, perhaps to the point of nausea, and movements that suggest the threat of biting, occur. The upper part of the face, is on the whole, less involved, and vast as the individual differences are in facial mobility, they are greatest of all for the forehead. Some have little power to raise the eyebrows or produce longitudinal wrinkles above them, and perhaps still less power to frown with vertical wrinkles, and fewer yet can produce both at once. There is less unilateral power of movement in the upper part of the face. The eyes may be open very wide, emphatic and frequent winking makes them flash and sometimes they are nearly or quite closed, but more often rolled up, down or sideways, to show the white. Some



children become almost virtuosos in making faces and this propensity seems to culminate shortly before the dawn of adolescence. The number of combinations of all the possible movements here is vast, and one cannot look over the literature upon the subject without being impressed with the fact that Darwin, Duchanne and the Delsarteans have as yet barely entered this interesting field. Head positions and movements are another factor which serves to bring out the effect, and children often use the fingers to intensify eye and mouth distortion, while gestures and noises aid to set them in relief. Interest in facial expression is deep and instinctive. All children study the face and especially the eye as an index of feeling and disposition, and the variously toned fear and pleasure in them suggest the strange passion of savages for masks as seen in their dances, many of which even introduce marked animal features. Pleasant expressions of the face are habitual for happy moods and for friends, and the principle seems to be that the degree of departure from one's best expression indicates the degree of dislike. Many facial expressions are no doubt directly intended to strike terror, but others are suggestive of various degrees of repulsion. Reverence and respect have their own characteristic physiognomy, while contempt even parodies or else seeks the contrary of it by the law of opposition. Very deep seated is the instinct of fear at very unusual expressions of face in those we know.

*Biting.* Sixty-eight females, forty-eight males. From our returns it would appear that this anger act culminates a few years before puberty and has perhaps a slight and brief increment at its dawn. Very young children, soon after the appearance of the first teeth which are small and sharp, not only try them on all sorts of things but in anger can make a painful impression upon fingers, nipples, skin, etc. Some children run up to an enemy, inflict a quick hard bite, and retreat with no other aggressive act. Others bite firmly and hold on with tenacity, and fewer in our returns chew what is bitten in anger. In their fights, biting often plays an important role with children. In a few cases children bite their doll, the foot or tail of dog or cat, sometimes the place to take hold is chosen with deliberation, and the grip is so firm that it is with difficulty that it is released. We have records of idiots that seek to tear flesh in their rage. In many a brawl in the lower classes, noses, lips, ears are chewed, and occasionally bitten off and other damage is inflicted elsewhere with the teeth. I once saw a man in a cheap show who earned his living by killing rats with his teeth in a small pen, with no aid from his arms. He seized and shook them near the back of the neck and was rarely bitten himself. In the sex aberration of masochism, biting

sometimes plays an important and even a dangerous role in the organism. The biting of anger shades off into gripping and grinding the teeth, which is so long a manifestation of it even in adults, connected with the act of retracting the lips to show them. Sometimes one method of control of anger is to bite the tongue or lips till they bleed, or to grate the teeth. A Baltimore murderer, under sentence of death, once told me that if he had had a little stick of wood, which he always carried in his vest pocket to bite when he was angry, he would not have inflicted the fatal blow for which he was to die. Of course the jaws in man are degenerating from the size and strength they had in his prognathic ancestors and in his rodent or carnivorous relatives in the ancestral line, but just as his type of dentition is composite, so this function seems made up of factors from both ruminants and carnivora now almost inextricably mixed. A large, strong jaw still suggests firmness and a small one weakness of character, and in children as in adults, there are the greatest individual differences here. Some seem made to perform the gymnastic feats of sustaining their whole weight, lifting or swinging heavy objects by the teeth alone. Both the first and second teeth often pull unusually hard and we may have here the basis for a position in what may be called dental psychosis. A distinction is repeatedly noticed in our returns between the square, even biting of young children and the more dangerous side grip, which is preferred when the eye teeth appear. Our returns do not suggest whether the biting of anger shows an increment at this stage of development.

Two things seem certain. First, that even modern civilized man has more or less adjustment between dental structure and function, the latter being proportionately less than the former. The passion of children for biting sticks, chalk, rubber, pencils, slates, chewing gum, etc., suggests that the biting of anger may be intensified by the fact that this function is declining and is both vented and mitigated by such activities. If man ever approximates an edentate stage with less mandibular power it will no doubt coincide with modification in this respect. The other suggestion which I venture is while the sneer, the *spasmus cynicus* of pathology, may no doubt be gestures which are relics of dental attack, the kiss seems to have a very significant and opposite function. Its meaning seems to be that where danger once was greatest, when we reflect that the maws of their enemies have been the grave of most species, that now not only a truce but complete trust, and even pleasure, reign. One feeble-minded child is described as making the gesture to kiss, but when the lips were presented set his teeth firmly into and almost through them, and, in the

opinion of the reporter, actually sucking with pleasure the blood that flowed.

† In adults the mouth often twitches, the lips are white, pressed or cold, and in the reaction the teeth often chatter. In 650 well-described cases, grating the teeth is mentioned in 27 per cent.; showing them in 21, quivering lip in 18, compressed in 11, pouting in 9. Some describe a peculiar "mouth-consciousness," others chew the tongue or inner wall of the cheek, swallow, choke, cannot speak, etc. Such expressions as "Would like to devour," "feel like eating, tearing, rending, crushing," occur with dental experience. Whether these are the last vaso-motor or involuntary automatic residues of what was once a fully unfolded carnivorous psychoses we can only conjecture. M. D. Conway, in his demonology, describes the devils or ex-gods of most primitive peoples as having for their chief characteristic capacious maws and dreadful mouths, with great, sharp and cruel fangs. The marks of many dances and ceremonies of the North American aborigines<sup>1</sup> are thus distinguished, and the instinctive fear of big teeth, so characteristic of infants is a psychic indorsement of the same fact.

*Scratching.* This is mentioned in 142 cases as a characteristic expression of anger, and is described more or less fully as habitual in the cases of thirty-eight males and eighteen females. The age at which it is most common is from two to nine years; and at fourteen, judging from our meager data, it entirely stops in males and is greatly reduced in females. While boys predominate in early childhood, the proportion is apparently reversed in adolescents and adults, women with their conservative organism then predominating. Instead of being clenched, the fingers are hooked rigidly and the movement is from the elbow and more from the shoulder, and from up downward. The point of attack is generally the face, more often the eye, although neck, hands, arms, and even the clothes are often scratched. In several cases anger at dolls, animals, inanimate objects and even self are expressed by scratching. One child lacerates her own face when angry. Two scratch the paint off doors and articles of furniture against which their rage is excited. Several have inflicted serious laceration upon younger children and infants, but in most cases the favorite point of attack seems to center about the eye itself, into which it sometimes seems a strong childish instinct to stick a finger. Our data give no indications that there is here any trace of an old instinct to attack the throat or any covered parts of the body. Occasionally in anger the hands are so tightly clenched

<sup>1</sup> In *My Study of Fears. Amer. Jour. of Psychology*, Vol. VIII, note, p. 312.

that, either with design or incidentally, the nails are forced into the palms. It would almost seem that some children have a love of scratching the skin as a motor activity independently of the sensation of stimulus or relief of itching along the afferent tracts. In the felidæ and in other animals, both in and near the conjectured line of human evolution where claws are best developed in structure and function, these movements seem among the first group to be acquired, especially by the forelegs after and superposed upon their locomotor functions. These movements are more specialized and accessory than walking, and among the climbers have a great but very different role. This may be set down as one of the first uses, then, not merely of the digits, especially of the pentadactyl hand, and this psychic co-ordination with dental function is close. The infant's finger nail is much sharper than the adults, is more curved, and hence has more sustained rigidity, while the skin of infants is thinner and more tender. Hence the greater effectiveness of this mode of attack. Very interesting are the few cases in which scratching is not mentioned, but in which one of the marked signs of anger which our correspondents describe in themselves is the purpling of the flesh under the finger nails. Interesting, too, are four cases where in anger a shudder which suggests scratching a file, rusty saw, or some other object, is provocative of incipient horripilation or some nervous spasm. This function is so co-ordinated with structure that careful and regular cutting of the nails may reduce it, as does the enforced wearing of gloves or artificial tips where the habit is abnormally strong. Some people shudder whenever they hear a noise that suggests scratching hard objects or the earth, and the very thought of scratching a brick or stone causes "sinking" symptoms of a very marked nature in F. 18. Long after this habit has passed away, many people describe as a symptom of anger the feeling that they would like to tear the flesh of the offending person. Again, some children cultivate long nails, less for use than for ornamentation, as several Oriental religious sects make it a sin to cut the nails, even if they penetrate the hand. Nails have sometimes an important industrial use in occupations requiring fineness and exactness. A few barefoot boys are described as scratching the antagonist with their feet. Civilization has so long required trimmed and shortened nails that it is possible that this has had an effect upon their reduction. The habit of biting the nails to the quick has very likely a kindred psychic origin with the impulse to trim them. Very curious is the survival in some of our cases, particularly females, of habitually trimming the nails to a point more or less sharp or obtuse. How many modern industries that involve scratching, like

movements such as writing, having any relation with any such ancient function, it is impossible to tell.

*Pinching and Pulling.* This culminates relatively late in childhood and continues at least to maturity, and probably through life. The strength of the opposing thumb must become well developed before it can be effective. Small children pinch the skin, often without bringing the nails to bear; the ear and nose are thus attacked and pulled. The arm is often thus made black and blue; the back of the neck is seized and pinched till the victim obeys the command to say "Shakespeare" or some other words, or to do some ordered and unusually humiliating act. Strangulation is sometimes thus attempted and the sexual organs may be thus assailed. Along with this action often goes pulling and shaking, indeed infants often pull hair and beard before they learn to oppose the thumb, and the difficulty of disentangling these from the baby's grip suggests arboreal life, in which the young thus hold to the shaggy sides of their parents as they moved among the tree tops, an act which natural selection has developed by eliminating those that let go and fall. While the child rarely shakes an object grasped with its teeth, objects clenched with the hands are often shaken. Both ears are grasped and the head violently pulled, twisted and shaken. One or both arms are thus used as handles by which to shake the body, so that the pain may be either in the pinch, in the pull, or in the shake. Where nails are used, the flesh may be dented, bruised or occasionally cut, and two instances are cited where poisoning is believed to have been thus conveyed by bacteria under the finger nails. The ears are sometimes permanently mutilated or distorted in this way, and far more serious is the injury, and once the death, reported from "Abelarding." In some conflicts handfuls of flesh from the breasts or any other part of the body are clutched and grave internal injury done. In one case, hair is said to have been pulled out by the roots and the scalp torn. In two descriptions of a fight, the tongue was thus attacked. In one case, the mouth was forced open for this purpose, and Mantegazza tells us that it has been thus torn out and the lips and the alae of the nose torn. In some forms of fighting the antagonists seek to pinch the fingers of their opponents, and particularly to twist and double them up to the point of dislocation. Sometimes any part of the body is grasped for a hold as one would grasp the clothes or through them. The variety of tortures possible in this way is great, and all must have been developed since the hand acquired its biped strength and dexterity. Not only folklore, but popular tradition, describes hand power developed to such an extent that by a single favorable grip an enemy has been disemboweled.

*Kicking.* This we distinguish from stamping as a lateral movement at right angles to it. It begins later, is far more common, and lasts through life. In most children the movement is front, but in some the stroke is backwards with the heel when it is more downward. The front stroke must discriminate very carefully if the foot is unarmed with a shoe where the blow is applied, for if it were a hard place in the antagonist's body the agent suffers more than the patient. Hence, the abdomen or the posteriors are common points of attack, the latter particularly permits the infliction of greater force and the blow has less danger. With shoes or boots any part of the body can be attacked, and the injury and danger is far greater. Some oriental forms of wrestling might be described as almost solely made up of tripping and kicking, where the arms and hands have nothing to do. I once saw two boys fight solely by trying to scratch with the feet. Heavy foot gear makes this expression of anger almost approximate in prominence that which it holds among some of the ungulate. One object is here often to overthrow the adversary and is peculiar perhaps to bipeds, who have assumed the erect position and for whom balancing upon a few square inches of foot surface with the center of gravity so high above, is quite a feat of equilibrium, and makes a fall often dangerous and an upright position always a little precarious. The usual strong forward kick as, *e. g.*, in football, and which is susceptible of a good deal of culture, is a mode of aggression which must have been originated however distinctly after the erect position had given the posterior limbs their strength and weight. It, like many other primitive modes of anger, has an extremely rich symbolic and metaphorical philology.

*Hugging, Striking and Throwing.* Young children often vent anger by hugging, and it is especially common among girls. The offending person or even animal is thus punished. As an aggressive method, this movement may become very effective and makes for strangling, the compression of crushing, and bones, joints and tendons may suffer thus.

Anger, however, is essentially repulsive and the gesture of pushing away is more common. From the latter, it would seem from such data as are at hand, striking evolved. The first blow in infants is a literally repulsive or standing off gesture. Although animals kick, butt, and strike with paws, etc., man might almost be called in a peculiar sense, the striking animal. His blows, although at first, perhaps, scratching movements, and at any rate more likely to be from above downward, change later into slaps, and last of all comes the straight out blow with the fist. This can, as pugilism shows, be made exceedingly effective with the unarmed hand. The skill and



dexterity in choosing the place and time of a blow, throwing the whole momentum of the body into it, to say nothing of foreseeing and warding off the blows of the adversary, make the development of this very human mode of attack susceptible of great perfection, and constitute the charm of slugging and mauling contests according to fixed rules, which eliminate forms of onslaught phylogenetically lower.

With the use of weapons began a new era. Even a stone or stick gives greatly increased efficiency and adds to the danger. Clubs, axes, spears, and a great variety of savage implements of warfare enhance many fold the dangers of conflicts and have prompted the invention of shields and other defensive and protective implements. It would seem from our knowledge of apes to be well established that they can use clubs and stones at least for certain purposes, but it is doubtful if these have ever been a factor in their combats.

Throwing introduces yet another development from the striking out blow. A missile is propelled far beyond the reach of the body, and bows, guns, etc., have made this the most effective, as it is the last, mode of offensive warfare.

We have space for but a few cases.

1. M. Fits of anger are plain in a child 7 months. She holds her breath a moment, seems expectant, grows red in the forehead and cheeks, straightens out stiff and rigid, trembles, chokes, and laughs merrily.

2. M., 8 months. Throws himself on his back, lies rigid and still, but yells at the top of his voice.

3. M., 15 months. Strikes himself savagely in the face, pounds his head but never any one else, spits at us and cries "Go way."

4. M., 2. Was set down hard on a chair for disobeying. He grew pale, then red, sweat profusely, made mouths as though trying to talk, but his teeth chattered. I only saw this once and am sure it has not occurred within the past fifteen months.

5. F., 26. A boy of 3 began to bite when in a temper. He always bites and kicks, throws anything and flushes.

6. F., 21. A 3 year old girl of violent temper, once punished by being kept home from a ride, broke out in sobs that appeared uncontrollable. Suddenly she stopped short and calmly asked if papa was in. Being told no, and realizing that there was no possible restraint from that quarter, she resumed her sobs.

7. Eng., F., 41. I know a boy of from 3 to 5 who had marked relaxation of all the sphincter muscles when angry.

8. F., 41. A delicate boy from 3 to 5, when angry, flushes all over his face, neck and ears. Anger so completely absorbs him that once he was undressed during a mad spell and did not know it.

9. F., 4. Prayed one night for the hired men. The next day one of them, a disagreeable tobacco user, kissed her; that night she prayed unctiously, "God bless papa, mamma, etc., but dear God, damn Mr.—."

10. M., 4. In a tempest of sudden anger strikes any one in the face with all his might. This he used to do when he was a year old, but in a moment he wanted to kiss.

11. Papa told M. to sit down. It was his evening play hour. He



drew himself up, looked his father full in the face and said "you dasshopper" three times, and then obeyed.

12. M., 4. In a passion has a blind rage, has thrown forks and knives at people, broken dinner plates and glass, etc.

13. F., 5. Is usually bubbling over with fun, but when crossed, rules the household, which has a terror of her tantrums. She screams, rolls on the floor, sticks out her tongue, turns up her nose, and takes it out in making up all manner of horrid faces.

14. Eng., F., 28. Children I have observed stand perfectly still, open the mouth wide, and begin to scream. Later they dance wildly, brandish the arms and hit anybody. Others lie on the floor and roll, pound their heads, roar, sit and rock; others bite and scratch; tears are a sign that the repentant mood has begun to react.

15. F., 19. Some children I have seen turn white or red, howl, strike blindly. Boys control their feelings far less. A little boy lay in the mud and screamed because I would not buy him candy. I had to pick him up and carry him home yelling.

16. F., 41. A little girl in a pet first seems pleased with herself and looks to her companions for admiration. She shakes herself, settles into stolid sulks, which sometimes last two days, then cries, relents, and is extra good.

17. Two little boys were set down to write, but there was only one pencil, which was given to the elder. The younger flushed, flashed, and said "Do you fink I can write wid my finger like God?"

18. F., 31. A little girl constitutionally obstinate, when in a temper would grow red as a turkey cock about face and neck, which would seem to swell with anger. Her eyes filled with tears, but she never cried. She readily asked forgiveness and never bore ill will. When people are slow, she wriggles, writhes, bites her lips, snatches your work, and wants to do it herself.

19. A girl of 6, who has ambition as her ruling passion, is most enraged by her jealousy. If she is excelled in writing, she will try to sponge out the work of others, and to scratch them, lie down in the grass and kick and cry, because she cannot jump as high as her mates.

20. M., 28. My temper was so dreadful that I did not mind what it cost, it must have way. As a child I would scream, kick, rush at things and throw objects in the fire or out of doors, if my plans were frustrated. To put me to bed disturbed the whole house, so that my nurse usually gave way to me. Every point I scored made me worse, I was often wild and utterly unreasonable.

21. F., 19. A sweet little girl of 6 I know has outbreaks of passion, that seem to pass beyond control, when, she stands and howls quite unconscious of everything. When it is all over she often cannot recall the cause of her temper. The only thing that helped her was diversion or some soothing action, like stroking her hand. When it is all over she seems to have forgotten both it and the cause.

22. F., 28. When I am inwardly impelled to say unpleasant things to people, I tremble, am short of breath, my teeth chatter, and often have a pain in my stomach, which causes sudden diarrhoea.

23. M., 28. When angry for sometime I twitch painfully in the palm of my left hand and also in the veins of my left wrist. In both these instances the pain is very much like the shock from a strong battery. It seems as if the blood was trying to get out of the small vessels causing them to stretch and snap back with violence.

24. Eng., F., 27. I know a child who has fearful fits of temper, after which a rash breaks out all over her body. Once she rushed into a tub of cold water with all her clothes on.

25. F., 19. When angry with the cat I used to squeeze it tight,

pull its tail, stroke it the wrong way, put my finger in its eye, and through childhood my anger generally vented itself by hugging.

26. F., 22. I literally boil. The angrier I am, the more compressed and internal it gets and the more silent I become. If I speak, I cry. My intellect is confused or rather does not move under the pressure put upon it. If I thoroughly start crying, the fit wears itself out, but if the cause requires action, I can stop crying. The effort to deliberate sets my mind flying.

27. F., 23. When I am angry I feel as if a demon was inside me tearing me to pieces, and if it must come out before I can be happy. Commonly it is vented in vicious little speeches, and deeds, aimed not particularly at the object which caused it, but at every one and everything. I take a sort of pleasing misery in contemplating the pain I inflict.

28. F., 29. Some children are white with rage, but more are crimson. They pinch, bite, scratch, and stiffen themselves. One little girl is so rigid that she can be picked up by her waistband, and held perfectly horizontal in the air. The sulky kind that hold temper is the worst.

29. M., 34. Symptoms of anger as I have seen them suggest the etymology of the word, which means compression of the neck, strangling, etc. This expresses my experience of it better than the words, spleen, vexation, ire, wrath, rage, resentment, malice, hate, indignation or any others.

30. I know people who change color, contort the face and even body. The hands clench, the muscles stiffen, the eyes flash and flame, the voice changes its pitch, time and quality. Some strut and other children dance, fall, butt, etc.

### III. ANGER AT INANIMATE AND INSENTIENT OBJECTS. VENTS.

Every one is familiar with the disposition to kick the stone against which one inadvertently stubbed a toe, to pound or even kick a door against which we have hit the head between our groping hands in the dark, and our returns abound in cases of pens angrily broken because they would not write, brushes and pencils thrown that did not work well, buttonholes and clothes torn, mirrors smashed, slates broken, paper crushed, toys destroyed, knives, shoes, books thrown or injured, etc. These violent reactions by which often the individual is himself injured, and in several cases seriously, occur not only in children but in adult and cultivated men and women. A man finding that the blossoms of a favorite and much nurtured pear tree were blasted for the third time, hacked it and barked it in a fit of rage, until it had to be cut down. A man of over forty fell over a roll of barbed wire at night, and the next day threw the whole into a bonfire and dumped it in a fish pond with much satisfaction. A farmer laying a stone wall found the stones so round and smooth, that they slipped down several times, and in a fit of anger, as he says, and not to split them into better shapes, he mauled them till he was tired with a sledge hammer. In one case described at length, a young car-

penter injured many times and even spoiled his own expensive tools, because he was so clumsy and inexpert that they would not work right; and the destruction of one's own or others' property by this impulse is frequently recorded. A few cases are appended.

1. F., 20. When a door will not stay latched, my little brother of 6 bangs it very hard several times, sometimes kicks, strikes, and even butts it.

2. F., 19. Boy of 4 grew often angry with his blocks, kicked and threw them, saying every time "Take that and that."

3. M., 19. I once fell on a large stone and hurt myself badly and vowed I would smash that stone sometime. Some weeks passed before I got a stone hammer, broke it to pieces, and threw the fragments in a fire.

4. M., 25. If when cracking nuts or driving a nail, I hurt my finger, I am so mad I have to smash something instantly with the hammer. Once my boot, which had been wet over night, was so stiff in the morning I could not get it on. In rage I pounded it well with my hammer.

5. M., 9. Pinched his finger in the door. Cried a while, then stopped and kicked the door, hurt his foot, cried again, kicked it again less intensely, scolded it and dared it to hurt him again.

6. F., 20. My brother M., 5, became angry with his drum and broke it into pieces. He fell on his rubber skates aged 7 and broke them both.

7. F., 18. I have vented anger on nearly all my toys, and could not keep them long if they were destructible. When angry I often drum with my fingers, tap my feet or if alone pound and stamp around.

8. F., 16. If I cannot play my exercises right, I pound the keys. If my sums go wrong, I throw and sometimes break my slate. I have torn books, cloth that I could not cut right, and smashed wood and sometimes bang the tools in the manual training room.

9. M., 17. When I could not learn something in my lessons, I used to sling the book across the room. My toys have suffered a good deal.

10. A boy of 8 cut himself with a knife, threw it in rage against a stone, and finally broke it with another.

11. A boy of 4 hits every large object against which he hurts himself, and throws all smaller ones.

12. M., 28. As a boy if I spoiled what I was whittling, I would throw or smash it if I could.

13. M., 18. When I used to bump my head, I wished with all my soul that I could make the thing I hit suffer for it.

14. F., 19. When angry I used to kick rocking chairs. This made them rock and this made me more angry, because they seemed alive.

Such things are often done with a kind of lurking, nascent self pity, sometimes with a trace of self contempt, but more often with a bottom feeling of the humorous absurdity of it all. Where pain is caused, such reactions serve as a vent, but on the whole we seem to have here a momentary lapse back to a primitive animistic stage of psychic evolution in which the distinction between the things that have life and feeling and those that lack both was not established. At any rate our organism acts as if the offending brick, stubble or tool was capable

of feeling the effect of our resentment. This very strange group of phenomena can only be partially explained by urging that most causes of pain are animate objects, and that it is a second thought or long circuit reflection that does not have time to act, that this particular cause is lifeless; while the preponderance of the direct vent upon the object, as well as introspection in such cases, shows that it is not a case of stimulus and undirected reaction.

*Vents.* Besides the direct action upon the cause of the offence, very many indirect ways of working off anger are common, and this is often the beginning of control.

1. M., 24. Biting my lips until they ache and bleed is far more effective as a restraint for me than the puerile method of counting ten. Music helps me and if I can get at a piano, I can play off my rage. My aunt knits off her temper, and a cousin always plays Schumann's Schummerlied, so that when we hear that we know she is angry, but will soon be pleasant. If a piano is not at hand, she suffers greatly.

2. F., Once I was so angry that I could not sleep until I got up, wrote the person a most violent letter, venting all my rage, and then tearing it up in the middle of the night. Then I went back to bed and slept sweetly. Girls, I think, are more angry, stay so longer, and do not forgive an injury as soon as boys. This is particularly true of girls from 12 to 15.

3. F., 24. I am reputed good tempered, but this is false, for I can fume and seethe within, when outwardly I am perfectly calm. I have a habit of giving inner vent to my anger by thinking cutting remarks; this relieves me, while the object of my indignation never suspects it.

4. F., 22. When my feelings are injured, I have now learned to be able to turn aside to something else. I cannot always do it, but this checks most outbreaks. I can often hold myself to my study.

5. M., 31. A cultivated lady of 25, wife of a well-known university professor, is sometimes so angry that she goes into the back shed and chops wood furiously, and says that something far worse would happen if she was denied this vent.

6. F., 23. When angry I used to pick up stones and throw them at something hard. The throwing relieved me some, but if they broke, the relief was much greater.

7. F., 9. Vents anger upon her hat and particularly her coat. Has sometimes broken things on the table in a pet, and in her tantrums is liable to seize almost anything anywhere.

8. F., 19. My youngest sister gets maddest if she cannot find things. She always pounds something. Her motto seems to be "Pound if not found."

9. F., 27. When I have been very angry I have just stood and pinched myself and bit my finger until I screamed. I used to want to tear something.

10. F., 16. When I am very angry or feel it coming on, I want to run to a particular place and pound the tin gutters for relief.

11. M., 10. Used always if possible to vent his anger upon stones; F., 7, on doors; M., 11, on bees.

12. F., 18. My anger is generally vented on my clothes. I go up stairs into my room and sling them around and sometimes dance on them.

13. American; Adult; Female. When violently angry would grind

her teeth, walk back and forth between two rooms so as to slam the door. Sometimes she would take a pillow and shake it until exhausted.

14. I always used to fly to the piano, or get my pet kitten to comfort me when I found my temper rising.

15. M., 26. I know a woman with a bad temper who when exasperated plays the piano or sings to herself, which latter is considered by her friends as a danger signal.

16. F., 28. When I was a girl and got angry, I used to shake my hair all over my face and make wry faces. It was very easy for me to speak out and tell very disagreeable truths. When trying hard not to talk, I play scales; and when very angry, octaves. To repress rage makes it far worse than to blurt it out.

17. I know a child who always relieves her ill temper by kicking a particular post. Her eyes are half shut and afterwards she shakes.

18. A nervous boy of 8 several times a day gets so angry he throws himself on the ground and screams as if he were being killed. He is growing thin and I think his temper will wear him out.

19. F., 27. For three years I had a pupil, nice in many ways, but addicted sometimes to say things quietly that nearly drove me mad. I always restrained myself, but once found that I had broken a new pencil that I had in my hand short off in my efforts to control.

20. M., 27. When slightly angry I can best let off my feelings harmlessly by swearing. If madder I feel like knocking out part of my wrath, and make awful vows of vengeance which I do not live up to.

21. F., 32. I can now generally control my naturally strong temper. I think volumes, but say nothing. It would be a luxury to wreak myself upon expression, but I refrain from prudential reasons. I know people would pay me back. I try to feel benevolently towards all, to make allowances when I feel injustice, to switch off my anger into a sort of philosophical indifference. Sometimes I get relief by working it off in an imaginary scene with the offender. My opponent says severe things and I answer still more severely, but always go off complete victor. This appeases rage, although I inwardly laugh at and despise myself, while giving this triumphant scene. I have invented an instrument of slight torture which I apply to myself, but which I shall not tell. It has helped me much. A plain two minute talk once by my older brother helped me.

22. F., 44. I get some relief occasionally by prancing about and ejaculating, especially if my heart thumps and my head aches too much. Sometimes I write a letter or even an essay on the subject, and then put it into the waste paper basket, and it has served its purpose of giving outward expression to inner wrath. If all anger has to be checked and I have to attend to conventionality, I sometimes have one of my fainting spells.

A man I know saws and chops wood in the cellar, some pound stones, children break toys, pinch themselves pound their own heads, bite their fingers, one child jumps into cold water, some tear their clothes, one must tear something, anything, one pounds the gutter pipe, another shakes a pillow, one bites a coin, several play the piano, one kicks a post, one pulls her hair over her face, some sing, take it out in imagining extreme retaliations, in inventing instruments of torture, in imaginary dialogues, fights, or other scenes in which the opponent is put at a great disadvantage. Profanity is a very common

vent, and many people have curious forms of expression, some comic, while in others it is simply round, honest swearing never heard at any other time. Scathing remarks are shouted, whispered, or perhaps merely thought. Some mutter, others walk it off, etc. This varies all the way from slight divergence from the object to something connected with it by some law of association or even utterly unrelated to almost inversion, as where excessive kindness or politeness to the enemy is the only effect observed. In some cases certain automatic movements like tapping, rocking, etc., sewer off the tension harmlessly. Just how far the pent-up energy of anger can be metamorphosed from malignant to benignant work is an interesting and practical problem for pedagogy, as well as for psychology. If education could transmute and utilize for good this great power, turning the wrath of man to praise, a great service would be done. The fact that some vents tend to become stereotyped and almost like a kind of ritual of rage suggests much plasticity, while the general fact that plenty of exercise and work, physical or even mental, provided it be not excessive, directly tends to lessen irascibility is full of suggestion in this respect.

Vents are resultants of two impulses more or less contradictory, one to react directly against the offending object and the other to struggle to inhibit that reaction. The consequence is increased psycho-physic tension and diversion to another point of escape, as a horse paws if it cannot go. Complete control would not be suppression, but arrest of all forms of expression for the rising pressure. Allbut thinks that what he calls tension, somewhat in this sense, is one of the chief psychometric criterions by which to measure both sanity and brain power. To check all vents of strong indignation would be, according to the current theories of the physical basis of emotion, to annihilate it, for if these are correct rage cannot exist without at least heightened tonicity and blood pressure, etc. These latter then, if necessary concomitants, are not vents, and control would be conceived as restricting it to these more involuntary tensions and preventing overt acts.

*Change with Age.* While infants scream, stiffen, hold the breath, strike, scratch themselves, chatter, kick, sob, throw, roll, etc., age almost always brings repression of these manifestations and increased control. The adult, instead of being impudent, may become sarcastic; instead of dancing up and down, may walk with heavy tread to and fro; instead of shouting, may talk to himself and use his tongue instead of fists; and while peevishness and irritability are less, remorse, reason, reflection, toleration of offences become dominant. As the mind grows there is more space for subjective expenditure of energy, and to think unutterable things that are not uttered



or to put into words the rising tide of indignation. It takes longer for an attack to reach its apex and it subsides more gradually; the effects are often less in the somatic and more in the psychic sphere; while the fact that the home, school, church and state repress by their various rules and methods the grosser manifestations of wrath, tend to make it rise to forms of expression that are more sanctioned because more refined. Conscience in some becomes a helpful deterrent, which is reinforced by religion. Physical causes are less frequent, while a larger area is exposed to psychic causes, and while capacity for anger often grows with strength and years, its frequency is generally greatly diminished. At adolescence it especially becomes more inward, while a new set of causes becomes operative. In old age temper may become serene and sweet, but if otherwise, anger grows impotent and often contemptible in its manifestations as its characteristic expressions become more limited and stereotyped. Middle life is the period when, if once thoroughly aroused, it can be most destructive, not only physically but in the world of worths. But this is the age of most intense preoccupation, most exhausting work for body and mind, hence on the whole, because other interests are so absorbing, of greatest immunity. A certain choleric vein gives zest and force to all acts, and increased manifestation of temper is one of the signs of weak wills and decaying intellectual powers.

1. M., 19. I used to abandon myself to anger, but since the age of 14 I have lived in circumstances which absolutely require self-control. I have grown to philosophize more before letting go, and can sometimes stop long enough to reflect whether I am really right or wrong. The dominant thought is the effect of the acts. As a child I used to feel that I could not act or squeal loud enough, and often wanted to kill the offender. Temper, I think, first shows itself in acts and then in words.

2. F., 31. As a child I must have been a perfect spitfire and would fight, kick and strike like a little animal, and must have been as soulless as Undine. Another little girl as bad as I fought with me, and we sometimes tore each other's hair for ten minutes. I usually came off with a great deal of triumph. About 11, chiefly under the influence of an older girl, I began to unfold a little heart and soul, and to realize that life was a little more than self-feeling and self-pleasing, when my childish temper quite disappeared.

3. F., 20. In the morning before I am fully awake, my temper is most ticklish. I am slow, but when thwarted and fully roused I am so transported with rage that I can neither move nor speak. If I can strike or throw something, my feelings are relieved as if a thunderstorm cleared the air. I end with passionate crying. Now, when I am beginning to feel these inner convulsions, I can control them better, and my remorse afterwards is deeper than it was in childhood.

4. F., 21. I find it unexpectedly hard to analyze my temper. It is bad, and I fight it constantly. When I feel myself going, I have forced myself to read of the crucifixion of Christ. At first I was unmoved, but soon tears came and I was all right. The old feeling of



fighting myself, as real as if with fists, has passed away. As a child I used to roll, to kick, and once bit my tongue. I now talk into myself. I still have the feeling that we have a right to stand up sometimes on our dignity, but still know that we should have more love and trust toward our fellow beings. I have a real sense of union with unseen powers and try to feel a oneness with the human race; and when I can, this helps me greatly.

5. F. I have diligently cultivated my natural bad temper, so as to give it the hasty, fiery form instead of the sulky one.

6. F., 21. I think I take offence quicker, but control it easier than when young. I feel temper to be childish and due to a slow, weak will.

7. F., 21. My temper has changed little since childhood. Perhaps it was then quicker and for different reasons, but not getting what I wanted has always been the chief provocative.

8. F., 22. From 12 to 16 my temper was so bad that my mother was in despair. Now the worst outbreaks have about ceased.

9. M. My temper is greatly improved since childhood. I am still quick to wrath, but it does not last. Small things trouble me most.

10. M., 18. Now I can control my fists, but not my tongue. When I do make a few remarks, I generally have the best of it. Father says I shall have to be knocked down a few times before I know enough to shut up.

11. M., 27. My disposition to passion has grown less because of a more favorable milieu.

12. F., 30. My anger confession is that when a child I slammed doors, made faces, was impudent; while now temper makes me irritable and, alas, that I must confess it, I scold.

13. F., 26. When small I would throw myself down; later clench my fists and stamp. Am far better tempered than I was, for much that once angered me does so no more. I have gained control over words and acts and feelings, and now can foresee causes of anger and thus avoid them.

14. F. My temper as a woman is so changed from that of childhood that they seem to belong to two different beings. Once explosive, I am now more morbid, peevish, and irritable. I believe it is because my life has been so unsuccessful.

15. F. As a child I rarely got into a violent rage with others of my own age, and think the reason was that I always spoke or struck out at once, and thus relieved my feelings before they had time to gather full force. With my superiors, however, fear kept my anger down until it would grow to an outburst. I always ran to an empty room, banged the door, raged and sobbed till I was tired out. Now, instead of crying, I clench my teeth and drive the nails into the palms; my heart beats so fast that I feel choked and my head seems as though it would split.

16. F., 29. I am less passionate than when younger, because I consider all sides and realize how easily people misjudge; try to be charitable, and think those with unpleasant or selfish ways worthier of pity than of blame. I want to help people struggle against their weak nerves, for I have my own.

#### IV. REACTION.

When the spasm or crisis of anger is passed, it leaves the system exhausted in exact proportion to the violence of the attack, and inversely as the strength of the victim. Many are faint, cold, tremble, feel weak, perhaps drop down

almost in a collapse of fatigue, and with symptoms of prostration. They have headaches, nausea, bilious attacks, tears, general mental confusion, restlessness, depression, a sense of growing old, perspiration. Many of these physical symptoms are direct reactions from an over-expenditure of energy. There are often peculiar and individual sensations, like bad odors, tastes, ringing in the ears, optical symptoms, prickling and twitching, palpitation.

The psychic reactions most frequent are mortification of having appeared at great disadvantage, humiliation for having showed low level and perhaps bestial traits, a sense of shame for lack of control, poignant regret, self pity, qualms of conscience for having broken through resolutions or other forms of restraint, renewed resolves for the future, etc.

In some cases, along with this, and still more rarely predominating over them, is a pleased sense of exaltation arising largely from the natural exhilaration due to an increased sense of vitality and probably from a sense that justice has been done, judgment executed, the truth spoken, the basis for new and better understanding laid, etc. In this case there is no question of regret or contrition unless for the physical results. Here belong some of those cases who profess to have never felt a sense of guilt, however strong the outbreak. This in some cases is due to the concurrence of emotional strength with intellectual weakness, which prevents forever complete reaction to a normal state. Some souls tend to remain with reference to the offending cases where the last wave of passion left them, and although a friendship has been broken forever, justify themselves. This occurs either where mental elasticity is less, or the power to cherish grudges greater, than normal.

Yet another type rushes precipitately to the opposite extreme of self humiliation and abasement. They are abject in apologies, take over much blame upon themselves, make it a virtue to claim more than their share of the fault, and pour out their souls in superlatives of confessional self immolation and pleas for precipitate forgiveness.

Another better poised type shuns all ostentatious reversion, and though perhaps feeling that they have been a bit brutish and treasuring the lessons of regret and even remorse, from disposition or conviction, never ask pardon but quietly ignore the outbreaks, are perhaps a little over sweet, but feeling that least said is soonest mended, glide back without a word to old relations. This steadier type does not usually go quite to extremes of manifesting temper, and this mode of atonement is no doubt on the whole sanest in some cases.

In some the reaction is chiefly moral and religious, and prayer

and other spiritual exercises, together with those of conscience, play a prominent reactionary role.

Some are able to react into a sense of the humor and ridiculousness of it all. Instead of being bestial, vile, undignified, disgraceful or unhealthy, it is simply preposterous and absurd; and the penalties of ridicule and caricature self inflicted may become habitual, and very efficient as a means of restraint.

1. Irish, F., 27. I tremble all over sometimes for an hour when a temper fit is passed.

2. F., 21. When it is over, I am exhausted and cold and tearful.

3. M., 18. When reacting from a bad mad I cry, regular sobs choking me all over, although tears are less plentiful.

4. M., 31. A violent outbreak leaves me worn out in body and mind. I am strong and healthy, but after my last could hardly stand, and I felt as if I had grown older, sadder and changed.

5. F., 22. When the passion is spent, then comes the weeping fit, and then great prostration.

6. F., 22. After I have broken out badly, I am tired and restless for days. My mind whirls on its own way and takes in nothing.

7. F., 41. After a mad fit, I am pale and faint, my hands tremble so that I cannot use them and I have to sit or even lie down from sheer relaxation.

8. F., 31. Anger makes me feel worn out but peaceful. I am often frightened that I can get so angry, and often have a nervous headache later.

9. I am usually thought to be good tempered. The reason is that it takes the form of a sort of muddled wretchedness, which I can usually save up till night and fight out alone. I am always left weak physically, but mentally better.

10. M., 18. I once almost killed a tyrant boy in our school, who bullied, but did not feel half as bad as after whipping my horse. When I had done so, I would cry for an hour with my arms around its neck.

11. F., 33. I know a girl of 13 who whines, scolds and is cross all day and the next day she is abed with a bilious attack. These alarm her, and she is trying to control herself.

12. F. When a spell of rage had worn itself out, I always reflected that I would be out of favor and get no petting. Until I had no other regret and did not know it was wrong. I remember vividly when first told it was a fault, and when I tried to stop I was corrected by being sent to a corner, and sobbed violently. Few things I ever did were harder than when I made myself pick up a book I had flung down, and go on with the interrupted lesson. I often try novel reading with success. Am very sympathetic with ill-tempered people.

13. F., 40. I react by feeling that I have been a brute, try to meet my enemy as if nothing had happened, think it rarely wise to apologize, on the principle "least said, soonest mended."

14. F., 17. I am generally very contrite and want to make up by taking more of my share of the fault, and find that sometimes prayer helps.

15. F., 21. Although in anger I feel very bitter and full of burning hate toward all mankind, my reaction is intense remorse, though I never speak of it.

16. F., 26. My feeling afterward is a misery too great to speak of or even write. I know it a most dreadful sin, and remorse is deeper in proportion as the object was dearly loved.

17. F., 24. When I give way to uncalled for or long cherished anger, I feel sore and angry at myself, afterwards realizing how horrid I am and how much sweeter others are. I rarely, however, think much about anger after it is all over.

18. F., 20. My reaction is shame, seeing the other side, difficulty in speaking to the person in a natural tone of voice, realizing how small the cause was and feel that I have been a great silly. It makes me wretched that I cannot take things more calmly.

19. F., 19. It is far harder to express contrition in words than in acts, and yet if others do not apologize, my liking for them cools in spite of myself.

20. F., 28. A storm that has long smouldered in me rages on often for a long time, especially if my sister, usually its cause, is thoroughly and at once subdued. I feel humiliated in my own eyes because I have failed in what I have most desired, namely, control.

21. F., 38. I easily forget causes of anger, but never the feeling, and my constant dread is lest I shall be stirred up anew.

22. F., 21. When I think it over afterwards and see how foolish it was, I see that I must forgive as I would be forgiven and resolve to be more sensible next time, but alas!

23. F., 24. My reaction is never referring or thinking of it, or perhaps saying I did not mean to hit or being a little more affectionate than usual, amending by extra docility and sweetness with much inward disgust with myself. Sometimes I overwhelm the object of my anger with kindness.

24. F., 20. My contrition is not very deep and I detest reconciliation scenes, but glide back to normal relations without a word. To say I am reconciled, before I feel quite so, helps.

25. F., 21. At the highest pitch of frenzy, I do not care what I say or do, only striving to make it the worse, but later my remorse is awful and aggravated by punishment from parents. At these periods all my wrong deeds, especially those known to my own self, would rise up and I would resolve to confess to my father. I never came to the point of doing so, because I feared the knowledge of them would break his heart and usually ended by resolving to wait until he was on his death bed.

## V. CONTROL.

Some children grow on towards maturity with no instruction that it is well to control anger and feel that not to fight on every provocation is a sign of cowardice. These cases are very rare, and experience soon teaches every child the necessity of some restraint. The simplest method is to command the voice, to speak slow, low, after a pause, and with steady and, if possible, kindly tones. Another is to relax in the jaws, arms and elsewhere the instinctive muscle tension and to undo, step by step, the attitudes and facial expressions after first restraining acts. The mirror sometimes makes a sudden revelation of ugliness that is a great aid. Repulsive and extreme exhibitions of anger in others prompt good resolves by way of warning, as do examples of great control by emulation. If one can assume even approximately the muscular expressions of the opposite state, anger cannot long persist; for its nature is very closely bound up with tensions, not all of which, how-

ever, are under control of the will. That effort in this direction is of very great psychic and pedagogic value there can be no doubt. This we may call, perhaps, the most direct way of control.

Next comes the presence of others, especially those who are respected, loved or not very well known. To have made an exhibition of temper before a stranger is so mortifying as to usually reinforce all the instincts of control. Some confess to having a very ugly or even dangerous temper, but declare that no person has ever seen its malignity. In other cases, persons with a reputation of good and even sweet tempers among their friends give way in the presence of one or two members of their own household to the vilest and ugliest outbreaks. In some families irascible children get on far better away from home, not only because their tempers are less likely to be spoiled by indulgence, but because of the constant pressure of restraint by the presence of those who do not know them well.

With the inflammable type, counting three, ten, turning around, any act or formula securing a little delay allows the slower acting powers of control to be heard from. Some temperaments can thus almost entirely burn the smoke of their own anger calentes, and for the flashy, petulant type of diathesis this alone may sometimes quite suffice.

Reflection of a moral or religious sort becomes more effective as maturity is approached. The repetition of a Bible text or some proverb not only secures delay, but brings in antagonistic motives. Recalling the compunction of conscience, the necessary acts and words of atonement, bringing in a vivid sense of divine watchfulness, the beauty of love and service even to enemies, remembering that they may have as much cause for anger as we. Sometimes ceremonies or prayerful exercises are effective.

Diversion is a great and most effective panacea. If the mind can be occupied with something else at once that absorbs it and prevents brooding, it soon glides imperceptibly into good nature and comes back to the standpoint from which offences can be regarded with equanimity.

By some or all of these methods, some bring themselves to a habitude of displaying and soon to feeling special kindness to those who injure them, although few learn to turn the other cheek to the smiter. Indeed, current ethical standards, even in the best people, hardly justify a literal fulfillment of this Christian precept. Literature furnishes a few examples of ascetic ideals, according to which imperturbability is almost in a metamorphical and even literal sense, as if thus superogatory merit were accumulated or treasure laid up in heaven. A young convert at Orchard Beach once told the writer that he

never knew such joy as when he was buffeted and insulted in his work of soul saving, and always indulged in ejaculatory thanks to God when he was cursed, struck, pelted with mud, snow or otherwise foully treated as a result of the crude methods of slum work to which his zeal had impelled him. The ethics of this frame of mind may well be doubted, and the world admires the Quaker, who at a certain point of provocation, lays aside his gray and his creed to drub an aggressor.

1. F., 18. I check rage by asking, is it right?—and try to weigh the facts. Since I was 14 I have realized how wrong anger is and can generally control it. It is very violent, but people do not know my struggles to curb it. Above all things, I hate scenes. All our family are irritable and nervous, and we have to steady ourselves. We all get on better when away from home. I sometimes try to think of all the times my enemies have been nice to me.

2. F. If I give way to my temper, I soon feel well and in love with the world and with every one in it again; but if restraint succeeds, I am miserable, overcome, want solitude, and feel that a heavy weight is hanging over me, or like a smothered volcano liable to burst forth.

3. F., 30. I have but once or twice in my life let myself go, and then went off like a whirlwind and stopped when I was ready. I almost never lose control. To restrain general irritability is far harder.

4. F., 15. A lot of girls last winter turned on me, threw snow and called me names. I wanted to pay them back, but something told me not to. I felt as if it were some one talking right to me. The girls said I was a coward, but still I did not hit them. The Bible, you know, says forget and forgive.

5. F., 40. If one I love angers me, I am simply benumbed. Bitter speeches, which I know would rankle, occur, but are never uttered. Between love and this assertion of my words, self-conflict is short, sharp, and generally results in perfect silence. I have noticed that I tap my foot and often open and shut my hands and perhaps my teeth.

6. F., 24. My temper has grown more tolerant of late, for I can sometimes check it by reflecting that others may know better, may be right, or have a right to their own opinion, that it is useless to strive or will be all the same a month or 100 years hence.

7. F., 28. I find it hard to think before I speak or to control my words, but I try to turn my thoughts to something pleasant. If I have the chance to do a person with whom I have been angry a good turn, and if I do it, which is not always the case, then all self feelings go. If my enemy makes advances by doing me a good turn, the anger goes, but then I feel remorse.

8. M., 32. To aid children in self-control, they should be taught command of the voice and hands, attitudes, and awards and punishments should be meted out with great delicacy and tact.

9. F., 22. I find some help by holding my face in my hands and smothering my screams, but must be alone where I can gesticulate and act out a little.

10. M., 27. When angry I am in a state of miserable tension all over. I feel it first about the head, in the temples and forehead. I am conscious of unwonted secretions in the stomach. I can lately help myself a little by forcing my attention to the drawn muscles and relaxing them. This makes me at least a little calmer.

11. F., 28. Control of anger I think comes largely from imitation. If children see others check rage, they learn to do so.



12. F., 19. Once I chanced to look in the glass when I was angry, and I did look so perversely ugly, that I now think twice before letting go. My face gets broad, heavy, babyish, the corners of my mouth go down and I frown awfully.

13. F., 27. Once my favorite uncle dropped into the nursery and found me on the floor kicking and screaming. He was shocked and said I looked more like a beast than a little girl. I was so ashamed that it cured me entirely.

14. F., 20. The more strangers are about, the less my irritability troubles me. Their presence is the best control. I am far worse at home. When vexed I try hard to think of something else or say to myself how much better it is to control myself or recall possible outbreaks.

15. M., 50. A murderer, awaiting sentence for crime done in a flash of anger, whom I know, told me he always carried a stick in his pocket to chew when in a rage to prevent such an outbreak as that he was to die for. When the fatal provocation came, the stick was lost, and could he have readily found a substitute, he is sure he would have done no harm.

16. I rarely felt guilty for rage and perhaps did not use to recognize my feelings as anger. There was no such self-condemnation as when I had lied. I did not apply Bible sayings about my anger to myself. As I showed anger chiefly to brothers and sisters next me in age, no adult knew how bad my temper was except the governess, who was the only one who ever spoke to me of the wickedness of anger.

*Abandon.* In really rare cases, there is either no power of control whatever, or else what power there is can be easily broken down, so that the individual is entirely at the mercy of his anger. If this is great, he becomes literally insane or infuriated, like animals suffering from rabies. This is sometimes seen in idiots, degenerates, imbeciles and other defectives. All fear of persons, punishment and other consequences is lost, and the individual is absolutely helpless and blind in the storm of rage. In excessive and prolonged provocation, when man is brought to bay and knows his case to be hopeless, and that he can only sell his life dearly as possible, a somewhat similar condition supervenes. This is not courage but fury, and the destructive impulse may be so strong as not to stop at any manifestation of suffering, danger, or even death to the victim, but may impel to nameless mutilations of corpses and the impulse to annihilate even self and others in the highest pitch of frenzy. Boys, who easily and really become blind mad, are usually defective or morally insane, and all extreme manifestations are generally restrained before strength or knowledge enough is acquired to make them dangerous, or they become amokers. p. 521.

1. M., 40. My boy striked when angry never quite straight, chooses a safe place like the shoulder and often with pounding down blows. Girls I have noticed are more likely to strike down. A lady I know when very angry speaks with the sweetest face and voice. Her manner is more charming than at any other time, but the things she says sting bitterly.



2. M., 29. Up to 9 or 10 my brother was so passionate as to be almost dangerous, and no punishment or disgrace affected him. He would strike wildly without aiming his blows; has thrown stools, hammer, stones and various things at me. We all used to be terrified and I used to knock him down and sit on him till he was quiet, unless some came to the rescue.

3. F., 38. I have a strong and secret dread lest anything should excite my anger. It is dreadful and I am always in hopes nothing will occur to rouse it. I fear it like physical pain. It is mental pain which I believe leaves a scar.

4. M., 30. The mother of a 14 year old boy had always vented much anger upon him, when one day for the first time in his life, he broke out with an awful volume of oaths, which paralyzed his parents and made them feel that he must be very carefully dealt with or he would be dangerous. It was, however, all game which he had put up deliberately and over which he chuckled.

5. My boy of 8 is passing through an irritable period connected, I think, with second dentition. He flies into a fury, throws, strikes, says he is crazy, and his body feels drawn up. I can see, however, that he has sense enough left to avoid doing the worst. His father, who is very nervous, believes in using the whip in extreme cases. This makes the boy pale, cold in his extremities, and nauseated. His older half sister is aggressive with him, so that his provocations are strong and frequent.

#### VI. TREATMENT.

Worst of all is humoring and the over-indulgence by which too fond parents are prone to spoil the temper of only or sickly children by excessive indulgence. Even good dispositions degenerate to moroseness under this regimen and a vigorous application of Dr. Spankster's tonic in such cases may work wondrous and sudden cures.

For strong, healthy children, whose will is not absolutely diseased by balkiness, whipping, if judiciously administered, greatly reinforces the power of self control. With young children it must often be a blow on the instant and without a word of warning or moralizing, and if there is a little instinctive indignation, it is all the better; and if not felt anger should often be simulated by the parent or teacher. This gives a quick sense of the natural abhorrence with which such conduct is regarded and teaches the child limitations beyond which its conduct becomes outrageous to others. Dermal pain, which is not so bad as sickly sentimentality regards it, thus comes to be associated with moral pain, both in self and others, where outbreaks occur.

Another effective method is neglect. By this the child is simply ignored, set aside from ordinary relations of intercourse, perhaps isolated as disagreeable, troublesome or sick, and thus comes to feel by their temporary loss what the ordinary relations of love, in which they live, really mean and are. It is let alone, treated with silence and affected indifference or even coolness or sadness. The social instincts are so strong

that the child soon wishes to kiss or make other signs of desired atonement, and to be taken back to the hearts of its friends as before. This method can be well developed and sustained, but with some has its own peculiar dangers and must not be carried too far.

Some are best helped by being left to the natural consequences of their acts. If they break their toys in a pet, they go without them. If they injure their clothes, bed, books, pets, they must be left to feel a sense of loss after the ruffled temper is calmed. If they litter the nursery or playground, they must slick it up, or if valuable things are endangered, they are taken away. If they treat others badly, their friendship is ostentatiously cooled. Thus they are made to anticipate the penalties of adult life.

In some, especially in small children and in those with a keen sense of humor, the risibilities may be appealed to, and the child provoked to laugh by diversion to funny acts, by caricaturing its own deeds, words, tones, appearance, and thus rage may be suddenly neutralized by its opposite.

Plain, straight talk is often effective. Sharp, incisive, graphic descriptions of their conduct, its effects, how it is regarded, its consequences when they are adult, often brings a realizing sense which increases their self-knowledge in most wholesome directions. No one can read these returns without pleading for judicious scolding, provided the time, occasion, person, etc., be well chosen. All languages are far fuller of words describing bad than those applied to good conduct, and these drastic expletives, thus at hand, should be made good use of. Perhaps it would be injudicious to advocate even a mild use of profanity as a mode of clenching or rebuking certain manifestations of temper, but surely if there is anything in the world that merits damnatory and diabolical terms, it is the extreme manifestations of rage.

In some cases I believe anger should be worked off by legitimate and regulated fighting. There are certain states of mind, sometimes provoked by certain offences, for which no ordinary modes of treatment are adequate; and to stand up squarely in a give and take conflict, whether with fists or with straight out pieces of one's mind to each other, teaches a wholesome sense of responsibility and also gives a hearty man-making type of courage. Every irascible boy at least should know how to box. Nothing is a better school of control than to face an equal in a fistic contest, and know that the least loss of temper involves a wild blow, a loss of guard, and a bloody nose or a black eye; while victory, other things being equal, is sure to rest with him who can take a stinging blow in the face or anywhere without losing his head and thus missing an opportunity.

Prophylactics should not be forgotten in cases that require special treatment. These are first of all good health, which always makes for serenity, active and sufficient exercise with regular work, absence of which is one of the surest modes by which anger material is accumulated. Primitive man had no regularity of meals, working hours or occupation, but days and weeks of idleness alternated with and prepared for by periods of excessive strain in hunting, migration, warfare, etc. Into such life rhythms, criminals and degenerates still tend to lapse, and a balanced regulation of income and expenditure of energy is the best palliative of every infirmity of disposition; congenial stated occupation acts especially as an alternative for those types of anger that tend to spontaneous monthly or otherwise recurrent explosions. Removal from irritating causes like relatives with similar types of sulks or irritability, teasing children, and a general atmosphere of kindness, affection, and freedom often work great changes.

1. F., 18. If riled I must be left by myself, for every attempt of others to soothe my ruffled feelings increases my irritation.

2. F., 19. No fear of punishment ever had the least deterrent or restraining influence. I always wished as a child, when angry, that I was grown up and could lay out the unjust person.

3. F., 20. A serious talk to me about my bad temper, when I was 16, helped me very much to both self knowledge and self control. My grandmother, who was very bad tempered, came to live with us a few years ago, and she was such an awful lesson of what I should grow to be at her age, that I improved.

4. F., 27. I think children should have it out with their rages, and that when the reaction comes, considerable reproof or punishment has its best effect. To remove causes of anger and find change of games, or playmates, to give diverting occupations and high ideals are best.

5. F., 23. I was allowed to lead in playing with other children. If they did not do as I said, I always declared that I would not play and, unfortunately for me, this soon brought them to terms. This hurt my temper.

6. F., 21. As a child I had few playmates, was much alone, and so rarely lost my temper. I had most things that I wanted and so had occupation enough to keep me from wanting much that I could not have.

7. F., As a mother of three children, whose father's family is full of nervous disease, I think perfect health the only cure of bad temper. The world is at best abnormal and civilization especially so. To make happiness a habit is to bring in the Kingdom of Heaven. If this can be evolved from a psychological laboratory, all hail to the laboratory.

8. M., 31. My mother once whipped me and then kneeled down and prayed for me. The latter made me more angry, only in a silent way, than the former. A moral lecture of being talked good to, or talked at, rarely fails with me.

9. Once F., 5, threw a favorite toy against a shelf. I put it up there for two weeks. She cast stolen glances at it daily. I also ask her, when in a pet, to say quietly, "He that ruleth his spirit is greater than he that taketh a city," and "A soft answer turneth away wrath."

10. A very sunny-tempered boy about twice a year had fits of uncontrollable rage, destroying everything within reach. These spells nearly ceased when he was about 9, but after one of them his nursery looked as if swept by a small cyclone. We never alluded to it, but let the litter lie until he took an impulse to clean it up.

11. My little brother, when in a passion, gets red, stamps, sticks to his will to the end, and, if spoken to, hits out in all directions. He is usually locked up, but the poor door suffers. When calmer, he is let out, but no notice is taken of him until a few days later, when he is spoken to seriously.

12. F., 34. My little 4-year old girl inherits considerable temper, and when she shows it I tell her she is sick or disagreeable, and to go away by herself. She soon comes back smiling and I tell her the sun is shining again.

13. F., 21. Sulkiness was my chief trait, but I suddenly and forever left it off when I was 12, when I went to live with my grandmother, who gave me a new treatment of simply ignoring me when I was sulky. She seemed to forget that I existed at such times and this made me miserable.

14. M., 28. A boy of 9 I know, when angry, used to have real spasms. The physician long treated him for extreme nervousness, but he grew no better. Another physician said it must be whipped out of him. His parents followed this instruction, and although he was very stubborn, peevish and fretful, it was whipped out of him and he never had another spasm.

15. M., 41. When my children were crying angry, I used to say, you can scream ten minutes longer, and they would have sufficient relief. Often watching the clock would divert them. Neither I nor the nurse ever say don't to our children.

16. F., 21. We can cause in M., 11, the worst fits of rage by making him laugh against his will. Punishment brings on a headache; with uniform kind and sympathetic treatment, all goes well.

17. My 10-year-old brother once cut me with a knife in rage. We learned, however, that if we cried out, you have hurt my sore corn, he would always melt to laughter, and would soon become penitent and ask pardon. His passion rarely left any trace after five minutes.

18. M., 42. Two children were very ill when they and the doctor said they must not be allowed to cry. Hence they were indulged till their tempers were spoiled. Any cross drives them into an ungovernable fury. They shriek and rave until exhausted. Their face is so changed that one would not know them, and they seem ready for any black deed. Curiously, if at the worst stage of their passion some funny word can catch their attention, they are calmed and laugh, and it all goes in a moment.

19. F., 27. At the age of 8 or 10 I fell into a state of feeling injured when everything said or done seemed aimed at me. This state recurred at intervals for many years and died out only when a great friendship and love came into my life. When I say stupid things, forget or remember too late, or plans have to be changed, I still am likely to look down, pout, stamp, be silent, etc. The sick are irritable brooding over their imagined wrongs, and self-conscious. The best way to cure this state is to break out suddenly with some funny remark or read a letter or something interesting, and it is amusing to see the change. Troubles are forgotten and happiness returns thus quickly, especially if several are together.

20. F., 24. Sometimes I can watch myself all through a tantrum, contemptuously, and perhaps laugh at my own excitement.

21. F., 22. When disagreeable and provoking things are said, I now try to laugh it off, and I find this very often succeeds.

22. F., 26. When other people are angry, it makes me calm; while if I am angry and they are calm, it makes me far more angry.

*The Long During Forms.* Instead of exploding, some children sulk for hours and days with little power to work it off otherwise than by making themselves miserable and diffusing an unpleasant atmosphere. This corroding state is both cause and effect of narrowed psychic range and easily grows into suspiciousness and may pass from the passive over into active and aggressive manifestations. It is hard to maintain this state without heightened self consciousness, which is prone to imagine slights, inuendoes, neglect, dislike, and may even fancy hostile schemes and plots. With a little morbid taint, suspicions of persecution may arise, especially in weak natures, and from this the passage to overt acts of vengeance has been admirably described by Magnan. Most sulkers and brooders, however, while good haters do not pass readily over to vengeance.

The law of retaliation, an eye for an eye, etc., is deeply seated in the human soul, and is closely connected with both the sense and with all the institutions of justice. Ancient and mediæval law was based upon the conception of injury for an injury, and elaborate tables of equivalents were developed. While courts now take the administration of graver matters of justice under their charge, much is still left to private settlement. In the scores of minor matters, we see in society this instinct of paying back in the same coin and which safeguards so much that is precious in life. Do others who do you, rather than the golden rule, is more germane for the natural and even for the twice born man.

Hate may be conceived as prolonged and more mentalized anger which may or may not express itself in overt acts. Usually it awaits occasion before it is heard from and it is often a strong factor in tests of popular suffrage, where those who believed themselves surrounded by friends find to their chagrin veins of disfavor where least expected.

Revenge seeks more than justice and would pay back with interest. It may be long cherished, even in the animal world, where grudges are harbored until their spite can be vented. Here we find long cherished and matured plans, the results of accumulated malice perhaps of months or years often involving calamities far beyond merit and not infrequently involving others in the doom of the victim. Among lists of infernal machines, slow poisoning, well schematized and insidious detraction, slander, libel, alienation of dearest friends, destruction of financial credit, moral or religious repute,—of all this literature, court records and individual observation abound. There are those

who can give the entire energy of their lives for long periods and even spend their treasure and take very grave risks to taste the sweets of vengeance upon an enemy. They are incapable of forgetting or forgiving, and their souls are soils in which all seeds of injury grow to preposterous dimensions. Such natures are constitutionally secretive, taciturn or cryptobiotic, and hug or nurse trifles sometimes purely imaginary until they fill the whole field of their mental vision. Had such souls the same creativeness in art, literature or good deeds, they would be great benefactors, but their passion is malevolence and destruction is far easier.

1. M., 27. A boy of 9 bore a long grudge against a shop keeper and for weeks sought an opportunity to smash his \$60 glass window. Pea blowers and small stones were often thrown and at last it was broken. The boy was glad, would not apologize and went to a reform school, although told that he would be released upon asking pardon. The worst children are those who harbor grudges and vent spite after a long interval, during which it seems to accumulate like compound interest.

2. M., 24. Boy of 12 saved his money and bought salt to put on the neighbor's lawn, and when asked why, gave a long list of mean things the neighbor had done to disturb his play. He said, "Now I am revenged, we are even, and I am happy."

3. M., 25. I know a man not of strong will but conceited, who is more discriminating and persevering in his revenge than in anything else. This he makes a holy thing and his chief object in life. He could wait for years to pay off his debts. He would even study the character of children, and relatives of his victims, to find the tender spot. Remorse he had none.

4. F., 21. In exceptional cases, as of insult, I recall and brood over every detail, holding long imaginary conversations with the person, giving her good chunks of my mind. In one case I kept doing this over and over, nursing my hate for two years. Then it suddenly went away, leaving only a half humorous contempt for the person. Even if anger fades, I never willingly have the slightest intercourse with such an one. I have always been thought to have an unforgiving character, and as a child, often did bodily harm.

5. F., 30. I know a woman who refused to speak to her husband or her daughter for a week, although living in the same house with them. She is glum, and thought all the time she was a paragon of virtue and controlled her temper because she did not speak.

6. F., 26. I believe in standing up for myself and in speaking with greater warmth and assurance of being right than I really feel sometimes. Years ago a friend spoke hotly to me and I coolly told her she was unjust. We agreed to part although I wanted to get right, but brooded over it for years. My subject of love was impaired by a sense of injury, but I have never been able to overcome it.

7. F., 30. A friend of mine is irritable, her spells lasting for days every month. She never smiles unless bitterly, contradicts everything. The world and all the inhabitants appear corrupt. Her lips are firmly set and her eyes are staring and freezing. This mood is followed by exaggerated mirth.

8. F., 18. When in temper I cannot be spoken to. I cherish a dislike, call up all previous misunderstandings, real or imaginary,



aggravate present case and make myself very wretched. I struggle to get out of these states but am more and more powerless to do so.

9. F., 42. When I was 16 a classmate lied to the teacher, saying she had helped me in an examination. I could not go to her without betraying the girl who told me, so I worked six months hard from sheer revenge, and got a higher grade certificate than hers at examination. This proved that she could not have helped me. All this time I could not say the forgiveness clause of the Lord's prayer, but she never knew I was angry.

10. F., 27. I would sulk if reproved and nurse my wrong, feeling that I was a martyr until I reached the point when I would weep. I would pout, refuse to smile, answer snappishly or not at all, and always strove to do the opposite of what was wanted.

11. M. I felt a certain triumph in sulking but do not then wish to be alone, as I do in anger. I imagine that the offender implores my pardon, which I take pleasure in refusing. Sometimes when I have sulked long enough and the person to whom I am sulking feels contrite, I sometimes wish I could force myself to the point of saying "forgive me," but I cannot.

12. M., 25. My father had terrible fits of anger, which occasionally went on for days during which he would be almost completely silent; while my mother, who is chiefly irritated by slowness as I am, is exceedingly voluble and loquacious when angry.

13. M., 25. If offended I often try to sulk in a very dignified way, but find it hard to keep this up long.

14. M., 31. My irritability, which I inherit from my father and which differs from strong passion, makes me feel as if I wanted to set everything and everybody around me flying, and then to be absolutely alone.

15. F., 32. I feel better if I can speak my mind. I have been so angry that I have felt I was possessed by an evil spirit, but it all seemed so senseless afterwards.

16. M., 25. If I dwell on things, anger grows, so I am usually angrier sometime after the cause, but rarely show it at the time.

17. F., 34. I never had but four outbursts of passion, and these were when 19, 21, 29, and 33. The cause was always injustice to self or friends, and I felt a horrid pain at what caused the anger, and immense relief at giving vent to the storm within. I never felt ashamed but often sorry.

18. F., 28. Anger must have scope or it accumulates with me. Blame rouses it most, next comes interference, although I know that often when this is by friends, it is an expression of interest.

19. Scotch, F., 19. My nasty temper never smoulders, but it is ablaze and over. I feel I must do something or explode, and must either say bitter scathing things or take violent exercise.

20. M., 38. My boy of 11 when angry, screams, speaks fast or in a gruff tone, and likes to break things. His reactions are emphatic and take the form of asking pardon of superiors, and showing excessive kindness to his inferiors. If his anger has free vent, he shows no desire for revenge later.

21. F., 27. My tempers first simmer, then boil, then explode in way that make me shake from head to foot. I am so unsettled for a long time afterwards that I find a walk the best way to work off the effects.

22. F., 26. If I repress rage entirely, from shame or any other cause, it lasts much longer. I brood over it, exaggerate the injustice and find it harder to reason myself into a happy mood of kindness toward the offender.

23. F., 37. I most dread those people, who when angry are pre-



ternaturally cool, precise and impressive. This is really the most terrible kind of passion, for you fear it may break out in anything.

24. Smothered anger that is not allowed to effervesce may become lasting and warp character, so that it is often hard to choose between the much and too little control.

25. F., 21. I do not rage but am irritable, and love to appear in-different and even cut my acquaintances. Injustice makes the most permanent resentment.

26. My daughter of 12 is saucy, impudent, when she is provoked, but rarely revengeful.

27. F., 28. Grumbling and fault finding is the worst; sometimes trials through the day come out in the form of petulance or fretfulness when children go to bed.

*Different Ways in which Individuals regard their own Anger States.* The condition of rage is almost always regarded as very distinct from that of normal consciousness. The natural untaught child has at first little sense of moral wrong in this state, but soon connects painful impressions with it in his own experiences, which make for control. The instinct of seclusion, strongest with girls, and the bearing a great deal before giving way, both attest the many fears connected with this state. Threats often imply peculiar dangers if this second personality once becomes ascendant. Boys, who boast how strong they are and the cruel things they might do if mad, as though their anger was a dangerous and concealed weapon; anger, which adds more or less consciously to its intensity by feigning impulses to do unutterable things—all these are often effective in intimidating not only comrades but often parents and teachers. The simulation of anger often so admirable as a pedagogic method, the dramatic assumption of many of the symptoms and expressions of rage, are sometimes very effective in preventing fights, and a due sense among adults in society of the danger to person, property, or reputation of making active enemies and intensifying dislikes, is wholesome and sanitary. To arouse this demon, which may carry away those about us in a frenzy of rapt passion, is a danger that should never be forgotten, for where abandon is complete, the dearest friend, the fondest wife, child or even parent, may suffer an almost complete reversion, and hate, as inverted love, may become the most intense and rancorous of all. A single spasm of anger has sometimes the power in some souls of expelling affection forever beyond the power of pardon or even truce, and perhaps this "old Adam," as a potentiality, exists in every soul and may break through every fetter.

1. F., 30. Righteous wrath makes my moral sense keener, but this, I find, is very wearing to the nerves. To have a strong feeling of "served him right," when a mean thing is done, is almost a part of conscience. During the first stage of venting anger upon an opponent there is a grim satisfaction, but fortunately for the race this soon leads to shame.

2. F., 19. After a mad spell I sometimes feel repentant, often indifferent, and always very glad that my temper helped me to do what I wanted to do but otherwise never should have done.

3. M., 29. I believe in causes of offence; it is better to have the matter out, for a good rage freely vented gives an easement like the "peace which passeth all understanding, which nothing else can give and which is not of this earth." I know people who will not speak to you for a week, when you are quite at a loss for the cause, and prefer hasty tempers to the sulks.

4. M., 30. I plead for more anger in school. There is a point where patience ceases to be a moral or pedagogical virtue, but is mere flabbiness.

5. M., 31. In my experience as a teacher it is often an excellent thing to simulate or pretend anger in dealing with young children. Some faults are better punished with a little heat of anger than in cold blood.

6. F., 29. I prefer to deal with fiery than with sulky people, and am sure that a pretty good temper is desirable if not in excess. It is sometimes well to speak out that we may know and be known, and avoid misunderstandings.

7. F., 22. A strong temper well under control is a great force, and may be used for good. Heaven knows I hope it may prove so in my case.

8. F., 19. I am so often in the wrong that I seldom have a chance for righteous indignation, but I look forward to it some day, for I really like to get into a passion.

9. M., 24. It is certainly a great relief to get in a rage once in a while, but I think it should be done in solitude.

10. F., 21. The excitement is the pleasant part of my temper, and I grumble, fume and scold.

11. F., 20. A girl of prickly, contradictory disposition, balanced by much judgment, if angry never speaks, but acts. Once when 17, and told to replace some trimmings she had scissored into 100 pieces from her hat because she did not like them, she was roused to higher spirits, the deeper the disgrace. Her merriest evenings were when she had been in trouble during the entire day, and so had thrown off all restraints and revelled in the freedom from responsibility of being good. All her moods were afterwards atoned by a storm of tears.

12. Scotch, F., 24. I can generally check temper at an unkind or sarcastic remark and occasionally do not show it at all. Only once within the last ten years do I remember giving entire vent to temper, when I suddenly flew up inwardly and boxed my brother's ears. He looked so astonished that, although I was trembling with rage, I could hardly help laughing. I have found it a not altogether unpleasant sensation to be in a great rage. It wakes me up and makes me feel very much alive. I do remember once more giving way, and I shook my bigger brother till I thought I could hear his teeth chatter. If unwell or busy, I often feel very bitter and cross.

13. F., 19. The satisfaction and relief that used to make the after feeling decidedly pleasant is less now than formerly, for now it often leaves me unsatisfied, which it never did before.

14. Scotch, F., 26. When I am angry, if any one is at hand, I speak with greater heat than I really feel in order to keep up my anger. It is a kind of luxury.

15. F., 28. I used to boast and be very proud of my hot temper. It left me revengeful, sulky and skulking. Now I regret it.

16. F., 22. If deeply offended, I feel dried up toward the person for weeks and months. If I speak to the object of my wrath, my voice sounds strange and abrupt to myself. I once stood for hours in

front of a teacher whose rules I had broken, with occasionally a long-impulse to give way, but something, I suppose false pride, prevented. I felt too strange and excited to be unhappy; the latter came later. Now rage is a sort of intoxication. I am exhilarated with a sort of unnatural happiness.

17. Many boys are as I was, fond of talking of their herculean strength if angered, warning others not to make them mad, lest they be annihilated when their rage is unchained. Such boys, if angry, often look, threaten or feign to attempt the most murderous things for effect, having themselves, however, fairly well in command all the time.

18. "Don't get me mad," said M., 10, "for if I am I can lick K. S. and B. (boys of 16 to 18) and the teacher himself. I hit the old man just once in the nose and made him bleed. He has not licked me since."

19. "When I get mad," said M., 11, "I don't know what I am doing. I might take out my dirk (he only had a small pocket knife) and cut your throat or cut your heart out and eat it, or rip you anywhere like a stuck pig. I should not know what I did till afterwards."

20. "Look out, don't do that, stop, or you will get me mad!" boys often say, speaking of this state as if it were a kind of demoniacal possession in which they were no longer accountable.

21. When I am misjudged, as I often am (for this is the way I put to myself the fact that my sister is far more attractive than I and gets all the attention) I show my temper by pretending to show nonchalance. "I care for nobody if nobody cares for me" is the spirit, although I do care very much indeed. Often I never wished to set matters right, but gloried in being a martyr.

22. M., 28. I act on the impulse and speak straight out what I think, say how maddening it is, give others a piece of my mind, tell them how they should act. If they think I make too much fuss and keep cool themselves, I am all the madder. I always say all that I mean and feel easier for having spoken out, but always regret it later.

23. F., 24. If my temper is upset, I feel disobliging and disagreeable. I never had physical signs of it, and have learned to avoid those I cannot live pleasantly with. When passion rises I have to weep, and must hide lest the cause of my anger should think my tears are those of penitence, instead of righteous indignation.

27. Psychological observations, like charity, are best begun at home, and I have all my life been at home with almost nothing so much as temper, although I never spoke willingly about it before, save once to the clergyman who prepared me for confirmation at the age of 16. My confessions are not complete, but I do not know how to write some things.

*Love and Dread of Seeing Conflict in Anger.* Both our returns and common experiences show that many, and especially women, have great and sometimes morbid dread of any manifestations of anger as of all other uncontrolled states. In animals, females are often described as watching with complacency the conflict of their rival males for their possession, and it seems probable that the intense horror of this state, which many females report, is associated more or less unconsciously with the sexual rage which has followed it.

The great interest and pleasure in a fight, which boys, men, and sometimes even women manifest, is well attested in the

history of gladiatorial contests, tournaments, the wager of battle, pugilistic encounters, duels, whether by students or according to codes, wrestling and many other popular diversions, the crowd that always gathers to see men, boys or even dogs fight, cock fights and bull fights, etc., are further attested. The spectator's first impulse is to see fair play, and to have the contest prolonged and continued until one or the other of the contestants is subdued, and sometimes the thumbs go down, and even death is postulated. The writer himself confesses in his own experience a quite unparalleled tingling of fibre and a peculiar mental inebriation, he has himself felt in experiences of this kind, which as a psychologist and especially as a student of this subject, he has felt justified in giving himself. The common experiences of life seem dull, there is a zest of heroic achievement, of staking all for the chance of victory, of doing and daring with the greatest energy and risk, and that despite the brutality and the sense of degradation which comes from defying the ban of social condemnation placed upon witnessing such scenes. They give a sense that is to a great degree true, that life is warfare, that the struggle for survival never intermits, is always intense and bitter upon whatever plane life is lived, that offensive and defensive resources must never be out of reach, and that in a sense every one must be either a good fighter or a coward. Compared with the utterly unregulated fights of quite barbaric human beings, all these forms of conflict are more or less refined by rules or by customs, and one moral which familiarity with them impresses is that muscular strength and agility and the power to use fists and other natural weapons, and even some kind of code by which under certain circumstances certain wrongs, which the law cannot reach, can be promptly and summarily dealt with, is a distinct advantage to the ethical nature of man and a real safeguard of the high-civilization.

1. The sight of anger in others causes an awe struck yet interested wonder in the spectator, and every one flocks to see a quarrel. A boy of 11 jigged, danced and leaped up and down on witnessing a quarrel between two girls, although they attempted no physical violence, but simply stared at each other and said bitter things in a low distinct voice. If the quarrel is by older people, spectators on the other hand retire in almost inverse proportion to their sex, age, and strength.

2. F., 26. My brother, 17, once was roused to a frenzy at his brother attacking him brutally and looking awfully. He was taken to his room, and I sat by all night fearing murder, or something else still more dreadful, to follow. The next day he was silent and sullen, but gradually became himself again. This experience I cannot even now think of without shuddering.

Alas for those who consume the power of arrest or control too frequently or too completely. Many are angels or demons just in proportion as they are rested or fatigued. The state called irritability is due to loss of inhibition, and when this is gone man is the victim of whatever morbid impulses may be evoked, and some forms of insanity consist essentially in the loss of this higher power of restraint and the liberation in unchecked violence of lower instincts. Not only anger but mania, acute and active melancholy and suicide are often thus explained. Intensity of impulse, like the power of control, varies through all degrees. Some have perhaps all the wild passions, hysterical impulses, and criminal propensities in great power, but keep them so in leash that their strength and perhaps their very existence is not suspected by their nearest friends till some unusual strain removes the power of repression for a brief interval when they break out with overpowering mastery. To have and to control them, however, in some cases seems to give the tension with which the best work of the world is done. One function of education and civilization is to restrain and tutor the too quick form of response we call temper. It is always a waste of energy which passes from the potential to the kinetic form, so that control is storage of strength for either endurance or for action. The irritable diathesis involves the loss of all sense of proportion as well as perfect dignity, and weakens discipline, and "temper is a weapon we hold by the blade." We can see thus how irritability is often a stage in the recovery from disease. This lower power of reflex is restored before the higher power of control.

Lange's<sup>1</sup> theory of emotions, as is well known, makes vaso-motor changes primary, even to those of the neuro-muscular system. Sadness and fear are at root vascular constructions with consequent diminution of voluntary innervation, while joy and anger are vascular dilation with augmented innervation. Joy, sadness, anger, etc., are not mysterious energies causing physical states and changes; but we must drop this psychic hypothesis and say conversely that sadness, *e. g.*, is simply a more or less obscure feeling of the vascular phenomena which accompany it. If these latter could be eliminated, nothing would remain of anger save a memory of its cause. In every emotion there is an initial fact, idea, image or sensation, but the emotion itself is nothing but a sense of those organic changes which precede and condition it. To prove such a theory, as Dumas well says, we must suppress all the visceral and peripheral changes and see if this involves the loss of the emotion;

<sup>1</sup> Les Emotions. Paris, 1895.

but this can never be done, and hence the theory is safe from experimental proof or disproof. Perhaps, however, some proportion may be established between emotional intensity and vascular instability. This view is essentially mechanical, basing feeling on physiological reflexes. The view of James<sup>1</sup> is that "bodily changes follow directly the perception of the exciting fact and that our feeling of the same changes as they occur is the emotion." "We are sorry because we cry, angry because we strike, afraid because we tremble, etc." These bodily changes are not merely vascular but are innumerable and are all felt. For the finer as distinct from the coarser emotions, weakened repetition of once useful acts, the Darwinian analogous feeling theory and that of easiest drainage channels, which are probably not the smaller muscles but by way of the pneo gastric and sympathetic nerves, are the three explanatory principles.

No one adequately informed on the physiological basis of psychic life will for a moment question this general view of the primacy of physical changes and no one who accepts the most cardinal principles of modern epistemology will hesitate to affirm another psychic element and to deny that the physical changes are the feelings. Not only ought these two precepts to be almost platitudes in psychology and have interest only for those still numerous, as the discussion of the Lange-James theory has shown, who hold that the soul is more or less entitive, but the same principles apply to every form of intellection as well, save only that instead of muscle tensions, blood pressures, etc., we must substitute more subtle changes in the highest nerve centers. This, too, is the only fruitful presupposition of modern psychology, vague and general as it must be in the present state of our knowledge. In all thought brain changes must be postulated as preceding in time and as all conditioning. A far better and fuller statement of this principle, so far as the emotions are concerned, has just been made, independently of and in entire ignorance of the Lange-James view, by Sutherland,<sup>2</sup> who makes an admirable digest of recent biological and psychological researches which seem to point to the conclusion that henceforth we must conceive that the emotions are to the intellect somewhat as the sympathetic nervous system is to the cerebro-spinal.

In general terms, we may say that the brain begins with the vertebrate series, and that the visceral ganglia that preside over nutrition, circulation and perhaps vascular tone, and the

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<sup>1</sup> Psychology. Vol. II, pp. 449-450.

<sup>2</sup> The Origin and Growth of the Moral Instincts. 1898. Vol. II, pp. 210-307. The Nervous Basis of the Emotions.

involuntary and non-striated muscles affecting nutrition, temperature, sex, etc., are the twilight region where the keys to the solution of the psychology of feeling must be sought. Most of the history of life as recorded in the rocks since the *amphioxus* has been devoted to the development of muscles and to laying the basis of all that they presuppose for the soul; and the suggestion is irresistible that the roots of our emotional life must be traced back to those paleologic ages where prevertebrate life had its fullest development. The feelings, therefore, are indefinitely older than the will, as it is older than the intellect. Mosso and others have lately laid stress on the idea that the physical expressions of the most different emotions are often more or less similar, especially if they are intense. It is no doubt true that strong feelings are so widely irradiated as to affect every part and organ of the body; and although pleasure states are more closely related with expansion and extensor muscles, and pain with ameboid and cellular contractions and in the higher forms with the flexor muscles, it seems improbable that emotions so opposite as anger and love should not be as strongly contrasted in their expression. Probably our emotional psychology has now only advanced to a stage of development more or less corresponding to that stage in general psychology when it was first clearly seen that the brain and not the heart was the general organ of mentation, and perhaps we are now at the dawn of a period of ganglionic psychology.



## PSYCHOLOGICAL LITERATURE.

### *Studien über Hysterie* von DR. JOS. BREWER and DR. SIGM. FREUD.

This little book, although it appeared in 1895, is not so generally known by psychologists perhaps as both its interest and importance warrants. With a different purpose than the great work of Légrand Du Saulle, the present study limits itself to those cases of hysteria which are of psychic origin. These are much more numerous than has commonly been supposed, and can almost invariably be traced back to some lesion of the psychic sexual region. Psychical hysteria is defined as "der Erregung, welche abströmt oder abreagiert werden muss." The excitant is of a compulsory nature and being ideational in origin is frequently hidden from the individual himself. It may often be reproduced by the aid of a light hypnosis or by pressing the patient to the point of confession, and upon such possibility and the degree of its success rests the therapeutic procedure of the authors. The key note of the discussion lies in the endeavor to find the causes or occasions of hysteria in sudden, painful experiences, shocks of some sort, frequently sexual, apparently present for the first time but really originating in years past. The clearest dependence is established between psychic lesions or shocks and the resulting hysterias with their various sensory and motor disturbances.

The Inhalts-Verzeichniss enumerates the following topics:

Part I. The Psychical Mechanism of Hysterical Phenomena, a reprint from the *Neurologischen Centralblatt* for 1893.

Part II. A history of cases, carefully detailed and with much of psychological suggestiveness.

Part III. Restatement of the author's theory and an attempt to find a basis for the facts noted in cerebral dynamics.

Part IV. This section, not the least fruitful, deals with the psychotherapeutics of Hysteria.

Three propositions embrace the carrying power of the author's discussion. *First:* Hysteria is for the most part psychic and founded upon reminiscence. As is explicitly stated, the shock as agent does not immediately provoke the symptoms, but the memory of the psychic shock acts as a sort of strange or foreign body, remaining active for years after the first impress. *Second:* The emotional force and pathological effectiveness of such reminiscences are due to the fact that normal, adequate reactions, either instinctive or expressional, are denied them. Hysterias are conditioned upon hyperæsthetic memories. *Third:* Such memories and emotionally surcharged reminiscences tend to form separate groups, giving rise to the well known phenomena of distraction, double consciousness, sensory, motor, and organic disturbances.

The hysteric consciousness has a field of its own, its reactions multiform and varied, subject to no apparent laws. Completed in its course of development, it leads to a sundering of the soul itself. Herein it may be likened to the self of the hypnotic state, many of the phenomena of the former are paralleled in the latter. So the authors would place beside the formula, "Hypnotism is artificial hysteria," the other proposition, "The basis and conditions of hysteria are found in the existence of hypnotic Zuständen." Thus the problem

of pathological associational groups of hyperæsthetic memories, so influential and effective of bodily conditions, pools itself with the efficacy of hypnotic suggestion in general.<sup>1</sup>

The authors assume a tendency to keep constant the intra-cerebral excitation. The regular normal expression of the emotions, the satisfaction of the fundamental needs of our being, the activities of our routine life are all aids in maintaining nervous stability. Shocks of various sorts from without, sudden fright, extreme sorrow or joy, over repression from within, too much monotony and uniformity may quickly raise the tension to the point of danger. The vegetative organs are normally insulated from the activity of the cerebrum, but under the circumstances stated, or others akin, the over tension of the cerebral excitation may break through its accustomed bounds, diffuse itself over wider areas, shunt itself into new paths. As with electric currents, weakened places of insulation may be broken through, the continuity of connection may be destroyed, or a "kurzer schluss" formed, thus laying a neurological basis for both the positive and negative phenomena of hysteria. Here belongs, too, what Oppenheim calls the "anomalous expression of the emotions," the purely motor part of hysteria.

The unique feature of the book is the method of cure as applied to psychic hysterias. In many cases, the complete confession of the circumstances and occasion of the original psychic shocks was sufficient to cause the phenomena of hysteria to vanish. In other cases, a light degree of hypnotism, or the "concentration" of the patient's attention by Bernheim's method, serves to aid the patient in recalling and reliving the occasioning factors. These, plainly and fully detailed in words, lead to the abrogation of the bodily disturbances likewise. Communication enlightens, discharges, relieves the tension, even if it be not held with the priest and followed by absolution.

The psychic process which was the point of departure must be reproduced in a manner as life-like as possible, brought in *statum nascendi*, and then detailed or confessed. Cramps, neuralgia, hallucinations, functional ailments, paralyses, anæsthesias, once in full intensity, have been caused to vanish. For example, the hysteric patient Frau Emmy (to which Freud devotes about fifty pages in detailing history, diagnosis, and cure) is the subject of successive traumatic experiences, early sexual precocity and knowledge, severe fright in various ways, attacks on the part of her brother, who is a morphine fiend, death of her husband, etc., all stored and surcharged with emotion, knit together into a pseudo-personality. These constituted a latent cause of hysteria, which always took the direction of some factor in this complex group of associational states. Treatment and cure were peculiarly difficult because "the second condition," the hysteric personality, had, as it were, so many roots, was so deeply imbedded and appeared under such diverse forms and activities. The treatment consisted, however, as in all cases of psychic hysteria, in securing repeated confession of all the shocks and morbidities and discharging the memory of the same day by day as they appeared.

A distinct tendency in this interesting discussion is to rehabilitate the sexual element as of prime importance in hysteria—a standpoint which is more or less repudiated. Freud, fresh from the school of Charcot, as he himself says, was prone to look upon the sex element in hysteria as a misnomer, but was led to a change of view by a careful

<sup>1</sup> Delboeuf's experiments and theory of cure by release of attention from the "life of relation" are suggestive, in this connection.

De l'Origine des effets curatifs de l'hypnotisme. Paris, 1888. A brief statement of theory may be found also in *Mind* O. S., Vol. XIII, p. 148 ff.

study of the remarkable cases detailed in Part II. The apparently correct inference from statistics that hysteria (which Dr. Weir Mitchell calls the domestic demon) increases notably during the adolescent stage of girls and immediately succeeding marriage in women, as well as the recent clinical records of Gattel, shows that the female diathesis is peculiarly susceptible to hysteric phenomena, just as paresis at the present stage of evolution is somewhat characteristically a male disease. In fact, the great functional changes and duties of woman, which mean periodic instability and tensional activity, might argue as much.

The book will thus prove suggestive to those hide-bound psychological thinkers who are over-dogmatic in fixing the limits of the normal in conscious life, as well as those who view the abnormal as *ipso facto* of no direct value to the task which psychology has ever in hand, the systematic explanation of conscious experiences.

ERWIN W. RUNKLE.

*History of Intellectual Development on the Lines of Modern Evolution*, by JOHN BEATTIE CROZIER. London; Longmans, Green & Co., 1897. Vol. I, pp. 519. Copious index.

This book is the first of a series of volumes in which the author sets himself the task of expounding the Intellectual Development of the world. In this volume the subject is brought down to the closing of the schools of Athens by Justinian. The evolution of Greek, Hindu, Hebrew and Christian (to 519 A. D.) thought are treated. In succeeding volumes, Mohammedanism, Mediæval Catholicism, the Revival of Learning, the Reformation, Modern Metaphysics and Modern Science, with the Doctrine of Evolution are to be dealt with; and the results of this comprehensive survey of Intellectual Development will be brought to bear upon the present problems of religion, philosophy, politics, political economy and sociology.

Hegel, Comte, Buckle and Spencer have already made attempts to reduce this history to fixed and determinate laws. But these attempts, though admirable and splendid in themselves—as efforts of the human mind to find itself—as scientific histories were foredoomed to failure. Not until our own times has a sufficient body of historical facts been brought together to justify an attempt to reduce them to fixed and scientific laws. Hegel was obliged, therefore, to enunciate a single general law for the whole field of intellectual development, instead of enunciating a number of more closely-fitting laws for its separate divisions and sections. Comte in his "three stages" shows how the *social* and *moral* phenomena of the several periods were connected, but his law was too wide and general to determine their *intellectual* curve and line of evolution. Buckle made no appreciable advance upon Comte. He merely presents the same thesis under different terms; and turns what purports to be a scientific enquiry into a magnificent piece of special pleading in the interests of a particular stage of intellectual development—the scientific or "inductive." As with Hegel and Comte, so with Spencer. His great law of evolution is too wide and comprehensive for a satisfactory explanation of the special problem of intellectual development. The law of endless differentiation as a cosmic principle is of prime importance, but is barren as an explanation of the limited problem in question. The sky, though spanning the world, and being the abode of the gods, is useless to protect man from wind and rain. The important point is not the knowledge that a new germ of religion or morality, once planted in the minds of men, will unfold in infinite differentiations; but rather the important thing to know is how a specific intellectual advance

takes place, how a specific idea becomes modified into another specific idea.

To enunciate such a special law or laws under which the intellectual evolution of the world proceeds, is the aim of this present work. The author finds three types of cause entertained by the human mind—these three being determined by the notion they have formed to themselves of the *nature* of the cause or causes by which they conceive the world to have been produced. These he denominates, for convenience, Religious Causes, Metaphysical Causes, and Scientific Causes. Upon these three causes as constant factors in the intellectual history of the world, he seeks to reconstruct the history of Intellectual Development. Instead of regarding Philosophy, as Hegel has done, as a swelling torrent which whirls into its own current Religion and Science as mere tributaries and spoils, he has figured it as only one form of thought among several, each of which has its own laws and modes of procedure. Taking his stand upon the human mind in its ensemble, not upon some segment, he uses each of the corresponding causes in turn as a fixed point by which to measure the other—like the surveyor, who uses the height of a tree to measure the extent of a field, and the length of a field, the height of a tree.

The author confesses, with fine tolerance, that the belief in a stupendous and overarching Supernaturalism everywhere enfolding and pervading the world, is largely personal conclusion and not necessary transferable to other minds. It is therefore not pressed upon the reader, but is left to his deep moods with their finer and truer spiritual affinities and intentions.

W. S. S.

*L'Idéalisme Social* par E. FOURNIÈRE, *Bibliothèque Générale des Sciences Sociales*. Paris. Felix Alcan, 1898.

The author is a convinced socialist; at the same time a true scientist.

Formerly humanity, being unable to conceive of an ideal on earth, looked for its ideal in a life of dreams, after the present life. At the present time the necessity for so doing no longer exists. Science has so developed as to afford no means for the realization of happiness in this world.

The old science—*e. g.*, the discussions on the *Universalia* during the Middle Ages—stood entirely aloof from practical life. To-day, although engaged in work independent one of the other, they both strive towards attaining the same end. It is not necessary to give examples showing how much the recent scientific discoveries have advanced mankind towards the ideal of a socialist.

It will be found that two other steps in the same direction have been taken: co-operation, and the division of labor, which even more than the development of science are a proof of the socialistic character of modern life. It is true, however, that much remains to be done in establishing the relation between the work-giver and the worker, which, as yet, is a sort of slavery, owing to the fact that the salary does not represent the full value of the work done, the work-giver retaining part of the profit. On the other hand capitalism is in a process of transformation, it is becoming impersonal, that is, corporations take the place of private capitalists in large enterprises—a new triumph of Socialism—and those are cases even where the laborer has his share in the profit, where he has become an associate in the business.

From the standpoint of economics the result of the latter movement will be that, owing to the progress science has made, production will be so abundant that the cost of living will be reduced to nothing. All this is advanced in the strongest and most logical manner.

Not so the second part: the development of the social institutions.

First the family. Capitalism has demoralized family life. Women, having to work in factories, are obliged to leave their homes. But there is some advantage in this state of affairs; earning her bread herself, has given to woman her social independence. She now is, or will be, a "social all" just as well as man.

The relations of the individual to the State will continue to develop further. Democracy has taken the place of monarchy, and the modern man does not admit that the State has any jurisdiction in private affairs, but that it must confine itself strictly to the administration of public matters. Mr. Fournière thinks that the time will come when public laws will be useless, because man will comply with what he has himself established, he being at the same time ruler and subject. This, as will be readily seen, is more than socialistic idealism; it is the anarchistic ideal of society.

Will the socialistic ideal ever become a reality? Mr. Fournière believes in it. The first thing, then, is to have mankind understand this ideal, to have a clear image of it in its mind, so that it may learn to live up to it.

A. SCHINZ.

*Le Suicide.* By EMILE DURCHEIM. Felix Alcan, Publisher, 1897.

This recent French work on suicide, though marred by provincialism and prejudice affords some views that are of real value.

The author is a professor of Sociology at a provincial University and has evidently seen very little literature of recent date on the subject, for his latest statistics are mostly those of 1870 to 1875 and are largely quoted from Morselli's "Suicide," published in 1882 in the International Scientific Series.

A more recent work, "Suicide and Insanity," by Dr. S. A. K. Strahan, published by Swan, Sonnenschen & Co., in 1894, in the same series with Gronlund's "Co-operative Commonwealth," the Social Science Series has statistics for 1880 and in some cases for 1890. Durchein shows prejudice in arguing that Catholicism is less favorable to insanity than Protestantism, founding his view on statistics of Catholic countries, though on his own figures suicides are only half as frequent in England as in Austria. Later figures give England 74 suicides per million inhabitants, and Austria 144.

The real fact, which none of these writers seem to have touched, is that suicide is most prevalent in rationalistic, intemperate countries.

The real advance of the French work on its predecessors is in the parallelism traced between suicide and alcoholism (distilled liquors). The Scandinavian temperance movement may diminish suicide in the near future.

A remedy is also presented, though it is only mentioned as a punishment.

It is taken from the New York Penal Code of 1881, which punishes attempted suicide with imprisonment not to exceed two years, or fine or both. Strahan and also Durchein show that suicide is no real sign of insanity.

H. L. EVERETT.

*La Religion et les Sciences de la Nature*, par F. BETTEX. Genève, 1898. pp. 296.

The author first discusses progress and actual evolution, then the relations between Christianity and science, and finally characterizes and points out the dangers of materialism. Religion is not knowledge, but life; and many of its postulates could be founded on science, to which, however, some are opposed. The physical is for the sake of the moral world. For the Christian there are three revelations: conscience, nature, Scripture. It is suggestive that 25,000 copies of this work have been sold.

*Religions Philosophie auf Psychologischer und Geschichtlicher Grundlage*, von AUGUST SABATIER. Freiburg, 1898. pp. 326.

Sabatier's religious philosophy rests upon psychological and historical grounds, and is here authoritatively translated into German. First the psychological origin and nature of religion are considered. Then follow religion and revelation, miracle and inspiration, the religious development of man. The second part discusses Christianity, beginning with Hebraism and the origin of the Gospels; then discusses the essence of Christianity and its historical forms. The third part treats of dogma, what it is, its historical life and development, the science of dogma and the critical theory of religious knowledge.

*General Introduction to the Study of Holy Scripture*, by CHARLES AUGUSTUS BRIGGS. Chas. Scribner's Sons, New York, 1899. pp. 688.

This is a very greatly enlarged tenth edition of the author's Biblical Study, 1888, which has been revised yearly for fifteen years in connection with text-book work and is now, on the twenty-fifth anniversary of the author's professorate, dedicated to the students and alumni of the Union Theological Seminary. The author's aim has been to take a very comprehensive and systematic, but somewhat superficial view of the very many special topics involved. Very much of it deals with what may be called externals, such as titles, names of authors, dates, etc., and those who look for much information on any of the special topics will be disappointed. Even such topics as the general teachings of Ritschl or Rothe, Vatke, Baur, or even just what the higher criticism holds, are treated so incidentally as to give almost no real information. We distinctly question the pedagogic method of such instruction, and think a true introduction should give far more prominence to the ideas of the different authors, and that, for instance, Paulsen, in his *Introduction to Philosophy*, solves this problem far better.

*Die Gleichnisreden Jesu*, von D. ADOLF JULICHER. Freiburg, 1899. pp. 643.

The author is one of the younger representatives of the new theology and it is this book upon which his reputation largely rests. The present volume is devoted to thirty-three parables, likenesses, and illustrations used by Jesus; and this affords the author an opportunity of not only displaying his very wide range of textual knowledge, but also of illustrating in the most effective way the leading tenets of liberal or higher criticism, which he represents.

*The Evolution of Christianity*, by RAMSDEN BALMFORTH. London, 1898. pp. 161.

The true view of the Scriptures and the forces that made it are first characterized from the inside. The beginnings of Christianity, which depend upon the question whether Jesus was divine or human, and the doctrine of the atonement follow. The organization and doctrine of the church, the mediæval reawakening and the definition of true religion are the other topics. The author's standpoint is distinctly liberal and ethical, and his creed is the Fatherhood of God and the Brotherhood of Man.

*Ethics and Revelation*, by HENRY S. NASH. The Macmillan Co., New York, 1899. pp. 277.

The writer discusses the relations between ethics and religion, the



spiritual significance of the free state, comparative religion and the principle of individuality, the church's conception of revelation, prophecy and history, Christ and the creative good. Their aim, conformably to the will of the founder of the Bohlen lectureship, is to show "that the Bible marks out the road along which conscience must travel if it would treat our life on earth with abiding seriousness." The writer is a professor in the Episcopal Theological School at Cambridge, and the author of *Genesis of the Social Conscience*.

*A Manual of Patrology*, by WALLACE N. STEARNS. Charles Scribner's Sons, New York, 1899. pp. 176.

This is a concise account of the chief persons, sects, orders, etc., in Christian history from the first century to the Reformation, with select biographical references. An infolded map and chart with several tables add greatly to the value of the work, which is almost as concise as a dictionary.

*Essay on the Bases of the Mystic Knowledge*, by E. RÉCÉJAC. Charles Scribner's Sons, New York, 1899. pp. 287.

The writer first discusses the various attitudes of the mind towards the absolute, empiricism, criticism, etc., then the mystic consciousness which knows God through the heart is characterized, together with the symbols expressing such knowledge. Mystic esotericism is simply the intensified state of consciousness we know as inspiration. Mystic intuition reveals freedom and God, but is always in part incommunicable. The mystic city is the characterization of an ideal state in which the heart and not the head shall dominate.

*Die Funktionsstörungen des Grosshirnes*, von ALBERT ADAMKIEWICZ. Hanover, 1898. pp. 242.

This concise and comprehensive study, after a general account of physiology, psychology, histology and symptoms, takes up first the mechanical and then the functional diseases of the cortex, the latter including all the anomalies of sleep and dream; and thirdly stimulus and laming are discussed. The second part is devoted to a summary of what is known concerning cortical areas and localization; and the third treats of the substance of the hemispheres, cells, fibres, etc. Three interesting colored charts are appended.

*Vererbung und Entwicklung*, von MAX KASSOWITZ. M. Perles, Wien, 1899. pp. 391.

Of the fifty chapters that compose this volume, which although finished in 1897 is now printed with a little change, the most important are—the origin of life; the primeval cell and nucleus; assimilative continuity; changes by mechanical influences; correlation between blood vessels and bones; changes by nervous stimulation; individual adaptation; the impotence of natural selection; sexual selection; the inheritance of acquired character; innate nerve mechanism; amphimixis; Lamarck and Darwin; germinal selection; social instincts.

*Essays in Psychical Research*, by MISS X. (A. Goodrich-Freer). George Redway, London, 1899. pp. 330.

These papers, collected from various periodicals, discuss haunted houses, crystal gazing, the divining rod, hypnotism, obsession, psychic healing and Saint Columba. They are written in a lively and interesting style and from a sympathetic standpoint.



*Arbeiten aus dem Gesamtgebiet der Psychiatrie und Neuropathologie*, von R. V KRAFFT-EBING. J. A. Barth, Leipzig, 1897-1899. pp. 207.

These four volumes in one comprise some score and a half of miscellaneous papers published by the author in various journals between 1878 and 1898. The topics most fully treated are—transitory insanity on a neurasthenic basis; the imitation of organic nervous diseases in hysteria; clouded and dreamy states; imperative ideas, sexual psycho and neuropathy; the latter comprising over 100 pages of new matter.

*Lehrbuch der Psychopathologischen Untersuchungs-Methoden*, von R. SOMMER. Berlin u. Wien, 1899. pp. 399.

This valuable work comprises an introduction on methods in scientific psychopathology and four parts: (1) optical, (2) moto-graphic methods on knee, pupil, hands, etc., (3) acoustic, and (4) on psychic states and conditions, including memory, number work, association and time. There are in all 85 curves and figures.

*La Dissolution Opposée à l'Évolution dans les Sciences Physiques et Morales*, par ANDRÉ LALANDE. F. Alcan, Paris, 1899. pp. 492.

After one chapter each upon mechanical, physiological, and psychological dissolution, the author discusses social dissolution and its consequences in law. The latter is brought about by excessive division of labor, assimilation of sexes, the dissolution of family and of ethnic groups.

*L'Instabilité Mentale*, par G. L. DUPRAT. F. Alcan, Paris, 1899. pp. 310.

We have here an essay on the data of psychopathology. All mental functions are characterized by instability, personality no less than others, and morbid stability is especially seen in sex function and age. The practical conclusion is an account of what the author calls mental therapeutics and preventative pedagogy. The writer's standpoint is purely psychological and is largely based upon the distinction between psychic continuity and discontinuity. Philosophers should not give over to doctors the business of curing mental diseases, but should themselves study the pedagogy of firmness and coherence of will and character.

*Primer of Psychology and Mental Disease*, C. B. BURR, M. D. F. A. Davis Co., Philadelphia, New York, Chicago, 1898. pp. 116.

This little manual is designed for use in training schools for attendants and nurses. It is an extremely elementary primer in psychology, morbid and especially normal.

*Psychiatrie und Seelsorge*, von A. RÖMER. Berlin, 1899. pp. 343.

Dr. Römer presents here a guide for the recognition and avoidance of the nervous evils of our time. The psychoses he treats are grouped under the three heads of organic, idiopathic, and constitutional. Very interesting is his discussion of transitory losses of responsibility as contrasted with permanent loss. The last part of the book is devoted to a discussion of the assumption and consequences of his doctrine and of answering four objections to it. That it exhausts the body at the expense of the mind, that it denies freedom, that it reduces the worth of personality, and is unbiblical. The conclusion of the work discusses the personality of the shepherd of souls among the insane, and he pleads for the institution of such a special office as practicable and necessary.

*Wild Animals I have Known*, by ERNEST S. THOMPSON. Charles Scribner's Sons, New York, 1899. pp. 358.

This is a volume of stories about wolves, crows, rabbits, dogs, foxes, mustangs, partridges, with copious and other artistic illustrations, and written in a charming style, which characterizes this clever author artist.

*The Brain Machine, its Power and Weakness*, by ALBERT WILSON. J. and A. Churchill, London, 1899. pp. 151.

This is one of those books in which a man evidently of years and experience has undertaken to put down his general view of life. He happens to be a doctor, and holds that prosperity in this world and perhaps salvation in the next depends upon the health of the brain cell. Hence, together with a discussion of cranial nerves, automatisms, speech, etc., marriage, religion, crime, alcohol, suggestion, education, and many other topics are discussed. The latter part of the book contains thirty-seven rather rude cuts of various objects illustrating his subject.

*Geschichte des Lebensmagnetismus und des Hypnotismus*, von H. R. PAUL SCHROEDER. Leipzig, 1899.

In the five Lieferung, ending with page 288, that have so far appeared, the author has brought his history down into the time of Mesmer. His work abounds in various illustrations and pictures of prominent representatives in the fields treated.

*Hypnotism and its Application to Practical Medicine*, by OTTO GEORG WETTERSTRAND. G. P. Putnam's Sons, New York and London, 1897. pp. 166.

Dr. Petersen has rendered a very valuable service to both psychology and medicine by translating the valuable contribution of Dr. Wetterstrand on this important subject. The very remarkable cures and ameliorations of stuttering, hysteria, chorea, light psychoses, insomnia, neuralgia, spasmodic movements, alcoholism, incontinence, etc., by this author's method of prolonged and artificial hypnotic sleep, constitute not only a contribution to modern medical methods but also to psychology.

*Twentieth Century Magic*, by NEVIL MONROE HOPKINS. New York and London, 1898. pp. 160.

This book deals largely with the construction of the newest magical apparatus in which mechanical, electrical and other experiences are involved. The magician's stage and tables are first described, then five new and rather choice bits of mechanical magic. Chemical and electrical magic follow. In all there are just 100 illustrations.

*Sexualismus und Aetiologie*, von G. HERMAN. Leipzig, 1899. pp. 116.

This is the first part of the first volume of a natural history of love designed as a contribution to sexual physiology. The author styles himself professor, and his captions are energetics and polarity, organs, contrectation and detumescence, living substance, physiocratic and psychocratic procreation. These, perhaps, give sufficient intimation of the mystic character of this work, which is nevertheless based to a great extent upon a study of recent morbid and normal physiology.

*Psychologie Comparée de l'homme et de la femme*, par C. RENOOZ. Paris, 1898. pp. 576.

In the first part the author discusses masculine and feminine psychology in general, with sections on egoism, envy, anger, doubt, pessimism, modesty, chastity, etc.; in the second part, the relations of the sexes are treated, morbid and normal; and in the third, the struggle and rivalry between the two resulting in the supremacy of man; in the last, the effort to equalize the liberty and opportunity and to lay down laws for each.

*The Last Link; Our Present Knowledge of the Descent of Man*, by ERNST HÆCKEL. London, 1898. pp. 156.

The author here attempts to resumé his more comprehensive, systematic phylogeny and present a concise picture of our present knowledge of the descent of man. The evidence from comparative anatomy, paleontology, etc., is first stated, and then the various stages from worms up, twenty-six in number, are briefly characterized and two new illustrative charts are printed. The second part of the book, beginning with page 80, is devoted to short biographic sketches of great biologists, and to notes on the theory of cells, factors of evolution and geologic time.

*A System of Ethics*, by FRIEDRICH PAULSEN. Charles Scribner's Sons, New York, 1899. pp. 723.

While less concrete and empirical than Sunderland's, the present treatise is far more so than we should expect from the author. Five chapters outline the history of moral philosophy, nine its basal concepts, and nine more the doctrines of virtues and duties. Sub heads abound in practical themes like drunkenness, clothing, poverty and wealth, modesty, suicide, temperance, justice, effects of welfare on character, nihilism, egoism, relations between science and religion, immortality, freedom, compassion, love of home, country, gratitude, lying, and flattery.

*L'Automatisme Psychologique*, par PIERRE JANET. F. Alcan, Paris, 1899. pp. 496.

This new and enlarged edition of this important work distinguishes first between total and partial automatisms. Under the first head, catalepsy, somnambulism and suggestion are discussed. Under the second, subconscious activities, anesthetics, and psychic disgregation.

*La Psychologie Naturelle*, par W. NICATI. Paris, 1898. pp. 423.

M. Nicati is bitterly opposed to current psychology because of its implications of supernaturalism and regards it as essentially a physical science tributary to others and divided into two general parts—one dealing with individuals and the other with society. Just as the parts of the individual are related to each other, so individuals are related to society, and the present work is preliminary to a larger general and social psychology. The present work treats solely of colors and is devoted to discussions of their scales, the mechanism of color in the senses and nervous centers, its gradations; and the second part treats of individual psychology, regarding individuality as a common attribute of forces as affirmed in the distinction between soul and body, and as culminating in determinations of the intensity of psychic and nervous force shown in electricity, cellular tropisms and movement, general sensibility, etc. The chapter on emotions makes it a basis of sensation, memory, knowledge, etc. Intelligence is a mechan-

ism, and in rudimentary forms is seen in viscera and vaso-motor ganglia as well as in the basal ganglia of the brain, which he thinks the cerebral seat of instinct; while higher intelligence is manifested in the brain. Psychic harmonies are classified as intensity, space and time, and are grouped in symphonies not without analogies to music. In general, unique and stimulating as is the author's standpoint, original as are his many illustrations, it must be granted that he has undertaken a work which in the present conditions of our knowledge must for a long time, to say the least, remain incomplete and unsatisfactory.

*L'Avenir de la Philosophie*, par HENRI BERR. Paris, 1899. pp. 511.

Professor Berr attempts here to sketch the synthesis of knowledges founded upon history. First a brief sketch of philosophy since Descartes is presented as a basis of critical, positive and ethical conclusions. Philosophy is to transform its metaphysical into scientific problems, and to effect a great synthesis not only of knowledge but of life and religion, which is to affect man and society in the profoundest and most beneficent way.

*Psychologie als Erfahrungswissenschaft* von HANS CORNELIUS. Leipzig, 1897. pp. 445.

The problem here attacked is the epistemological basis of psychology, which he would base on purely empirical to the exclusion of all metaphysical conceptions. The contents of consciousness, memory, recognition, association, abstraction, speech, definition, and feeling are the elementary facts. On their bases are discussed unity and expectation, subject and object, the unity of personality. The third chapter attempts psychic analysis of the unnoticed contents of consciousness; and in subsequent chapters sensation, memory and fancy, the objective world, truth and error, feeling and will, are treated.

*Die Seelentheorie*, von F. HANSPAUL. Berlin, 1899. pp. 292.

The laws of natural egoism and adaptation, together with the pedigree of the human spirit, might have been the title of this book. In one chapter the influence of speech upon the brain, in others the effects of association, the relations of egoism to society, the insufficiency of Darwinism, the justification of punishment by the State, are discussed. From these standpoints the author attempts to show that the soul is as old as the body and begins with the primeval cell, that it has persisted in a chain of continuous development for millions of years, and will perhaps develop into unknown forms millions of years hence; for life, egoism, will and understanding are all one and the same thing, whether in plant, animal or man.

*System der Philosophie*, von JOSEF MÜLLER. Mainz, 1898. pp. 372.

The fruit of twenty years of philosophical study is here presented in condensed form in the belief that it fills a gap. Philosophy now is less in need of originality than of accuracy. The center of the author's view is his theory of consciousness. The book falls into three general divisions: (1) epistemology, logic and metaphysics; (2) psychology; (3) ethics, with an appendix on the philosophy of religion.

*Der Wille und die Freiheit, in der neuern Philosophie*, von MAX KRIEG. Freiburg im Breisgau, 1898. pp. 40.

This physiological study is divided into two parts—pre-Kantian and post-Kantian. Under the first, Descartes, Spinoza, Leibniz and

the English philosophers are discussed; under the latter, Fichte, Schelling and Schopenhauer.

*La Nouvelle Monadologie*, par CH. RENOUVIER et L. PRAT. Paris, 1899. pp. 546.

A careful characterization of the nomad is first given from various standpoints in all its orders and relations. The composition of monads follows and there are chapters each on passion, will, society, and justice. As an orderly digest of Leibniz' work, it is the most co-ordinated and systematic we have ever had.

*Esprits Logiques et Esprits Faux*, par FR. PAULHAN. F. Alcan, Paris, 1896. pp. 362.

The most important part of this perhaps too neglected book is the characterization of logical types. The equilibrators, the reasoners, the outrancers, the pugnacious type, the contrastors, the associators by contiguity and by resemblance. The false or illogical minds are those characterized by predominance of directive ideas or of insufficiency of them, of abnormal phenomena, the sentimentalists, the detailers, the frivolous and the puerile.

*Psychologie der Veränderungsauffassung*, von L. WILLIAM STERN. Breslau, 1898. pp. 264.

The sources of our knowledge of change are due to perception, reproduction and comparison. The fineness of it is measured by an elaborate technique for each sense. The psychic excitability for changes and their law is affected by fatigue, rapidity of motion, intensity, direction; and under these captions the entire discussion of the book falls. It is illustrated by various tables with curves and some apparatus.

*R. Rothe's Speculative System*, von H. J. HOLTZMANN. Freiburg i. B. 1899. pp. 269.

It is one of the noteworthy signs of our time that Richard Rothe's opinions should now attract so much attention in theological circles. No doubt he deserves a place next to Schleiermacher's as one of the most original religious thinkers of modern times, and it is therefore a very opportune piece of work to digest his views in a compendious form. First his speculative principles are treated, then his general view of God, the world and man, next his principles of ethics, individual, piety and love, then his doctrines of sin and atonement, virtue, duty, State, church and the final close of all things. From superficial glances through a few chapters we think this work is well and conscientiously done.

*Critériologie Générale*, par D. MERCIER. F. Alcan, Paris, 1899. pp. 371.

The general theory of certitude is here treated in its origin in the different fields of ontology and logic in its relations to doubt, scepticism and dogmatism, and especially with reference to the philosophic theories of the criterion of knowledge. The different forms of criticism and the problem of objective reality conclude the book.

*Journal of the Anthropological Institute of Great Britain and Ireland*. London, February and May, 1899.

The long articles in this first number of a new series are on The Hill Tribes of Central India; Caves, Shell Mounds and Stones in South Africa; Totemism; and the Presidential Address, January, 1899, by F. W. Rudler.

*Nouvelles Esquisses de Philosophie Critique*, par A. SPIR. F. Alcan, Paris, 1899. pp. 146.

A brief life of the author fills the first twenty-seven pages. The topics discussed are: The Nature of Common Sense; The Role of Idealism: Force, Change, Order, Finality and Evolution in Nature; The Foundations of Religion and Morals; and Immortality.

*The Emotion of Joy*, by GEORGE VAN NESS DEARBORN. Psychological Review, April, 1899. pp. 70.

The chief conclusions here reached are that extra emotions consist in outward expansive and in contraction of extensor muscles, to which habitual inhibitions of civilized life supply the apparent deficiency in the kinæsthetic theory of human emotions. The contraction of extensor muscles is more pleasant than that of flexors.

*Die Abstinenz der Geisteskranken und ihre Behandlung*, von HERMANN PFISTER. F. Enke, Stuttgart, 1899. pp. 88.

This is a discussion of the causes, symptoms and cures of the persistent refusal of food, so often found in the insane asylums.

*Conduct and the Weather*, by EDWIN G. DEXTER. Psychological Review, May, 1899. pp. 103.

In this very interesting study, the author sums up results of his own continued investigations upon the subject, from which he reaches the following conclusions: that meteorological conditions directly affect metabolism; they also influence the reserve energy capable of being utilized for processes other than those of the vital organs; they influence the emotional state and the two last determine conduct. The latter, and also death and labor of mind and body, bear very different relations to reserve energy.

*Zur Analyse der Unterschiedsempfindlichkeit*, von LILLIE J. MARTIN und G. E. MUELLER. J. A. Barth, Leipzig, 1899. pp. 233.

This comprehensive and very acute experimental investigation was conducted by an American lady in Müller's laboratory in Göttingen. After describing the methods of experiment, the second chapter discusses the enormous differences of the numbers obtained in right judgments; the third takes up the influence of time; the fourth, miscellaneous circumstances which influence the differential sensibility investigated; and the fifth treats of adjacent or supplementary comparisons.

*Einleitung in die Vergleichende Gehirnphysiologie und Vergleichende Psychologie*, von JACQUES LOEB. J. A. Barth, Leipzig, 1899. pp. 207.

This interesting comparative study of brain and soul is conducted with special reference to invertebrates and describes experiments upon actinia, echinoderms, worms, orthopods and mollusks; discusses the theory of animal instincts, heredity, the relation between brain and soul, and suggests future points of attack for the study of the mechanics of brain and activity.

*Elements of Alkaloidal Aetiology*, by A. M. BROWN. Henry Kimpton, London, 1889. pp. 86.

This is an introduction to the study of auto-intoxication in disease and is a popular summary of a larger work by the author, and gives the views of Selmi, Liebrich and Gautier.

*Die Nervenkrankheiten des Pferdes*, von HERMANN DEXLER. Franz Deuticke, Leipzig und Wien, 1899. pp. 277.

This interesting and very original book discusses the subject under four heads—diseases of peripheral nerves, of the spinal cord, of the brain in its different parts, and neuroses.

*Studies from the Psychological Laboratory*, Directed by JAMES R. ANGELL. University of Chicago Contributions to Philosophy, Chicago, 1899. Vol II, No. 2, pp. 615.

This interesting pamphlet contains the following studies: one on overestimation of vertical as compared with horizontal lines; a study in habit; the relations between certain organic processes and consciousness; habit and attention; modifications of the relations of dermal and optical space; the intensity of light as affecting visual estimates in depth; the most important paper being the third.

*The Psychology of Reasoning*, par Alfred Binet. Open Court Publishing Co., Chicago, 1899. pp. 191.

This work is based on experimental researches in hypnotism. After defining perceptions and images, the author describes reasoning in perception and the mechanism of reasoning, and insists that the two are at root the same. Reasoning is a kind of supplementary sense, the single type of all intellectual operations and is an organization of images.

*University of Iowa Studies in Psychology*, Edited by G. T. W. PATRICK. 1899, Vol. II, pp. 163.

To this interesting volume Professor Patrick himself contributes articles on The Analysis of the Taste Perception and Some Peculiarities of the Secondary Personality, while Dr. Seashore determines various psychological statistics and describes new apparatus.

*La Prostitution Clandestine à Paris*. Par le DOCTEUR O. COMMENGE, médecin en chef du Dispensaire de Salubrité de la Préfecture de Police. Paris, Librairie C. Reinwald, Schleicher Frères, Éditeurs, 1897. Vol. XI, pp. 567.

This is a solid and authoritative book, written by one who has had unusual facilities for the study of its subject, and who has spared no pains to attain to accurate results. M. Commenge began collecting the material for his work in 1887; and we may truly say that he has done for "private" prostitution what his predecessor, M. Parent-Duchatelet, did for "public."

The chapters are entitled: the causes of prostitution in general, and of private prostitution in particular; arrests, and their results; the Dispensaire de Salubrité, and its special function with regard to unregistered prostitutes; classification and statistics of venereal disease; the Infirmerie de Saint-Lazare; the sources of supply of unregistered prostitutes; their previous occupations; their life subsequent to medical treatment and discharge; registration and control. The writer makes a strong plea, on statistical basis, for state control and police registration.

E. B. T.

*Contributo allo studio dell' automatismo psicologico per autosuggestione* del Dott. G. ANTONINI. Riv. Sperim. di Fren. (Reggio in E.), Vol. XXIV (1898), pp. 626-654.

This interesting study, meant to throw light upon the mediumistic and spiritistic phenomena, which of late have almost monopolized the attention of certain psychologists, deals with the autosuggestive



psychic automatisms of T. Teresa, a young woman 28 years of age, whose first hysterical attack occurred in 1890, brought on probably by persecutory ideas, and who wrote a number of letters in the name of other persons, conscious knowledge of which she seemed not to possess. Dr. Antonini considers the case one of great importance, since the phenomena are remarkably like those of the slate and other writers among the so-called "mediums." The autosuggestion in both cases is much the same and to the persecutory delirium of Teresa may correspond the "faith" of the mediums, both giving a certain logic to their productions.

ALEX. F. CHAMBERLAIN.

*L'Isterismo infantile. Studio critico e contributo clinico* del Dott. AURELIO LUI. *Ibid.*, pp. 745-771.

In this article Dr. Lui gives an excellent *résumé* of the most recent discussions of infantile hysteria, besides two observations of his own and bibliography of over 50 titles. The frequency of hysteria seems to be greatest between the eighth year and puberty; girls suffer somewhat more than boys, but in the early years the difference may be very small, the sexes being as yet not so markedly divergent; heredity and errors in the education of the child are important factors; onanism has rather a predisposing than a causal value; bad nutrition and its train, infectious diseases, imitation, etc., play their significant rôle. Noteworthy is the enormous psychic hyperæsthesia and excessive impressionability and irritability of character in hysterical children, and their tendencies towards precocious development. One must be careful, however, to distinguish the simply nervous from the hysterical and by watching the development of the psychic habits of the child detect the outburst of real hysteria. While suggestion in the waking state is universally commended, much difference of opinion exists as to hypnotic suggestion as a therapeutic in infantile hysteria, Dr. Lui holding, with Joffroy, that the latter should only be used in the gravest cases, if at all.

ALEX. F. CHAMBERLAIN.

*Sull' Influenza dell' insonnio sperimentale sul ricambio materiale. Ricerche* del Dott. GIULIO TAROZZI. *Riv. di Patol. Nerv. e Ment.* (Firenze.) Vol. IV (1899), pp. 1-23.

Detailed account, with many tables of experiments concerning the effects of insomnia upon the organic metabolism of adult dogs. The general conclusion is that "there exist special mechanisms, regulative of the metabolisms, and when the function of these is once interrupted, 'organic failure' rapidly supervenes, followed by death,"—in the cases under consideration death occurred at from one to 4 days. It would appear that under these abnormal conditions the elimination of N is sensibly increased only at a very advanced period of the experiment—the augment continuing till death; the  $H_2SO_4$  and the  $P_2O_5$  present no constant characteristic modifications, while the Cl diminishes constantly in the last days before death.

ALEX. F. CHAMBERLAIN.

*Ricerche sperimentali sull' origine di alcuni errori della memoria* del Dott. JACOPO FINZI. *Ibid.*, pp. 101-110.

The conclusion arrived at by the author, whose researches are to appear in Kraepelin's *Arbeiten*, is that "the errors of memory are, within certain limits, a normal phenomenon in the process of the fixation of recollection,"—the principal source of error being in the action of the impressions previously fixed.

ALEX. F. CHAMBERLAIN.

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